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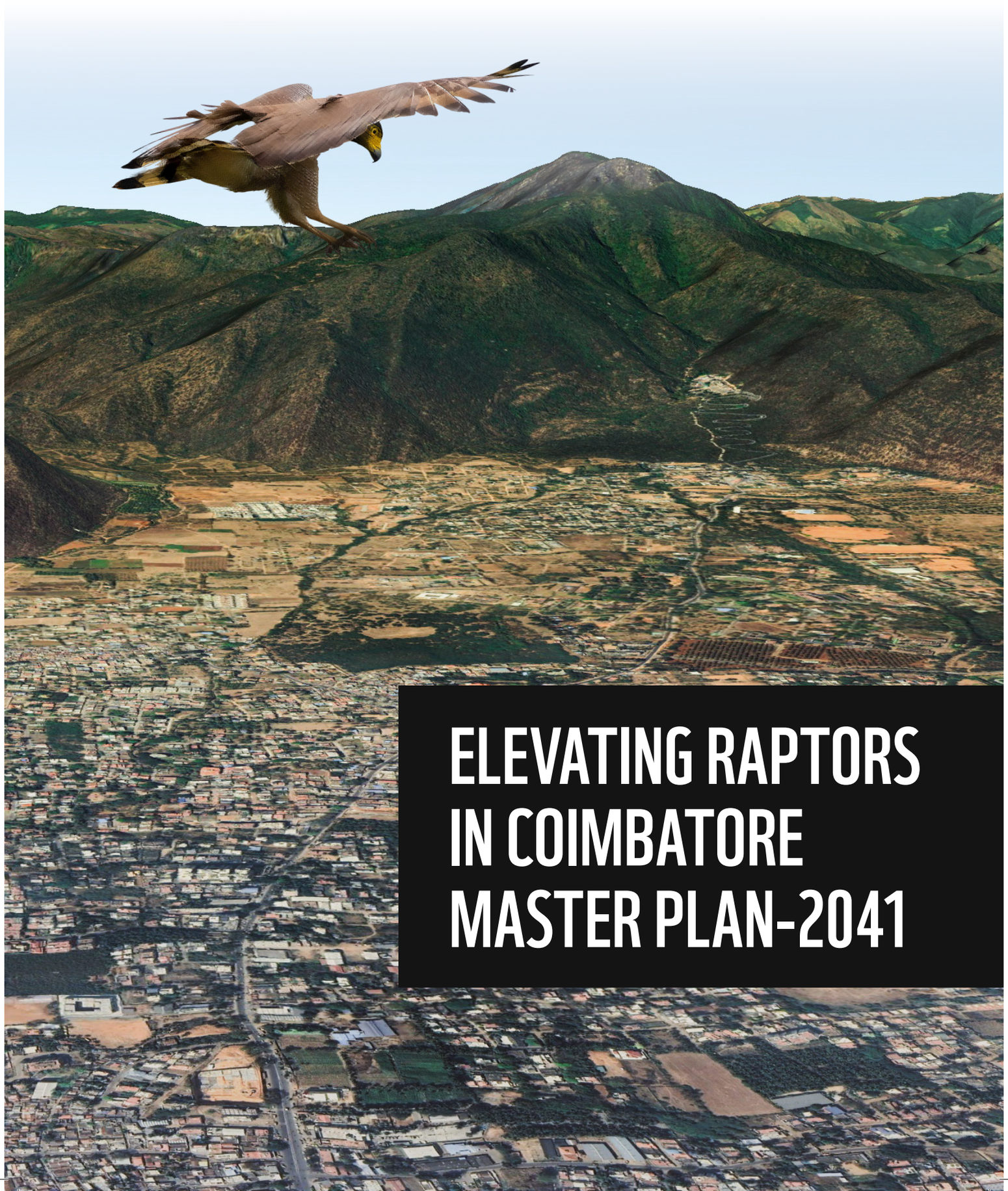

ELEVATING RAPTORS IN COIMBATORE MASTER PLAN-2041

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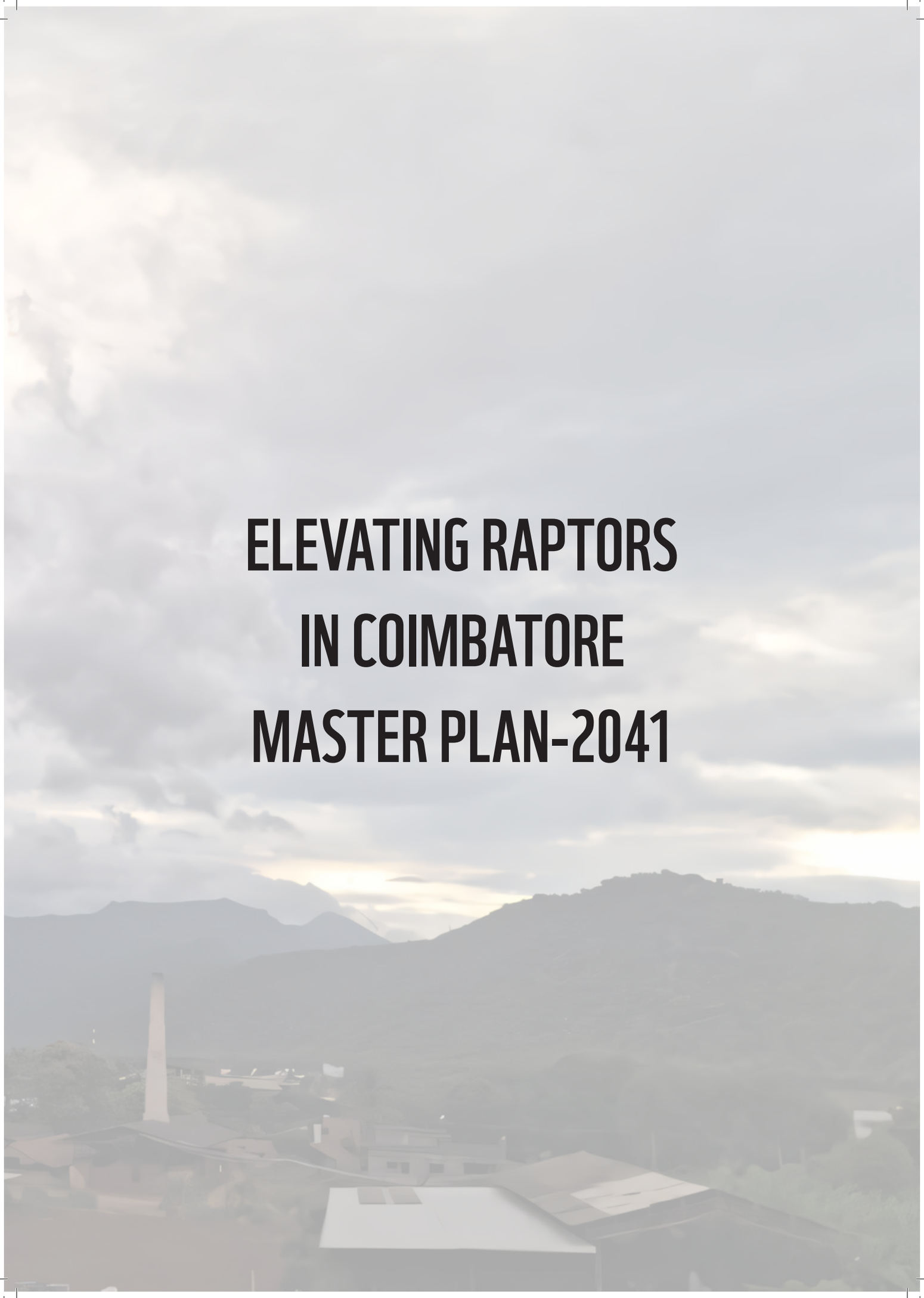
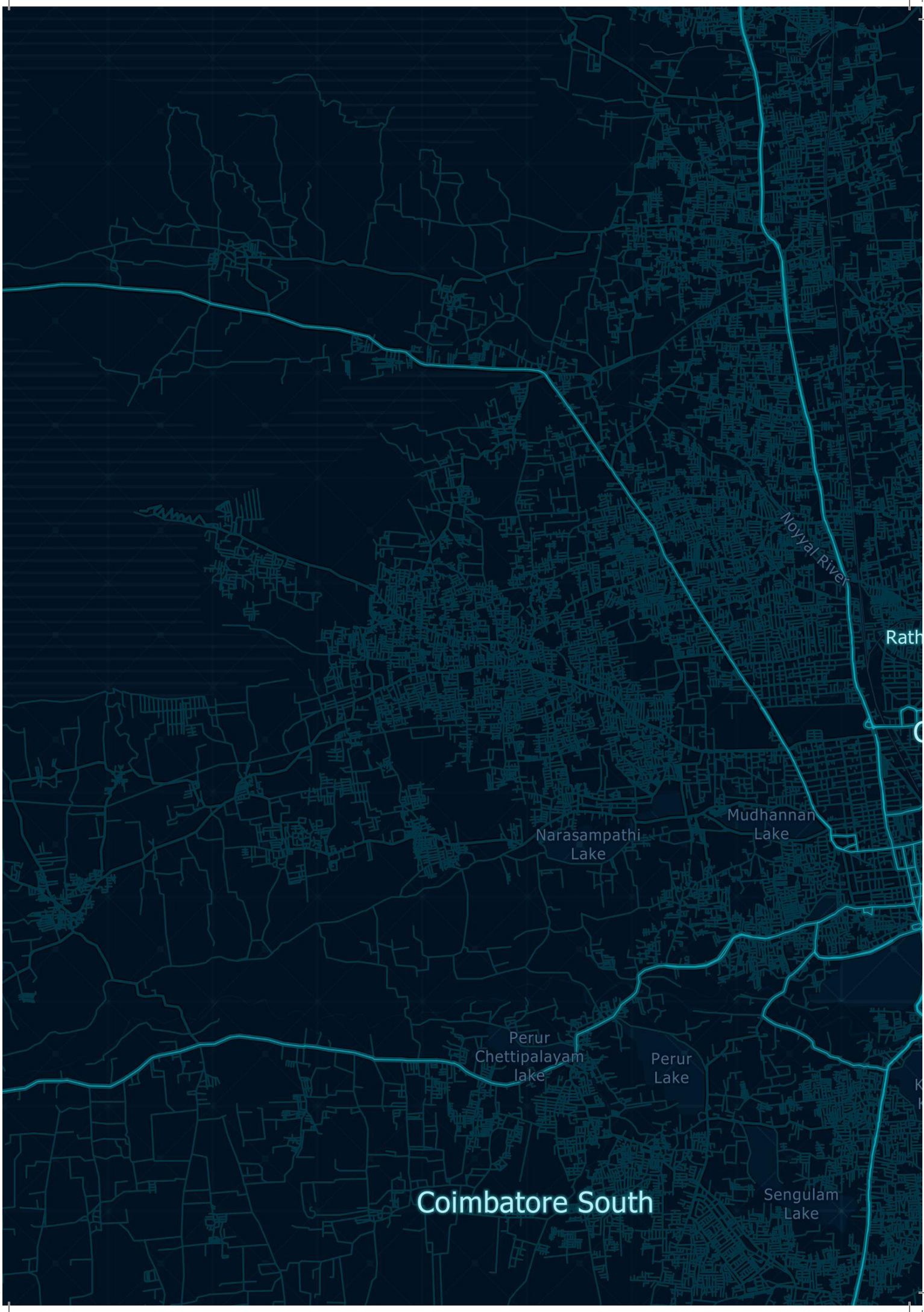


ELEVATING RAPTORS IN COIMBATORE MASTER PLAN-2041


Noyyal River
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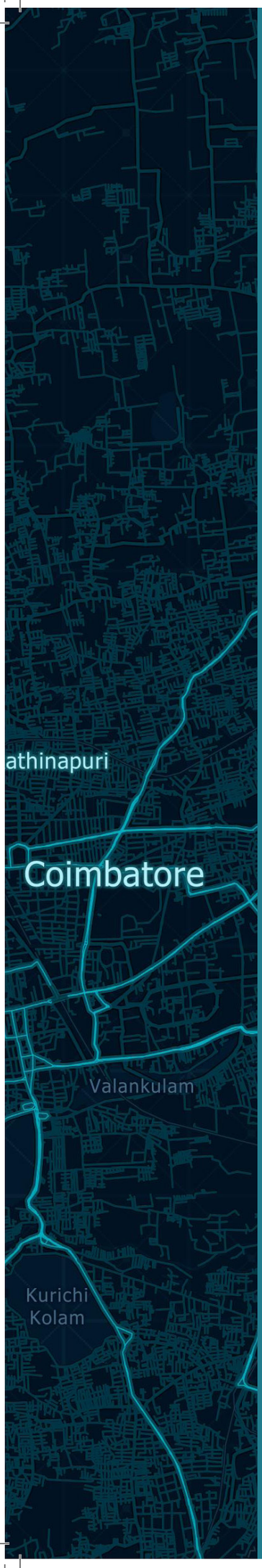

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ACKNOWLEDGEMENT

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Finally, we thank Mr Ravi Singh, Secretary General & CEO, Dr Sejal Worah, Programme Director, and Dr Dipankar Ghose, Senior Director, Biodiversity Conservation from WWF-India, for their vision, encouragement, and overall support.

We are thankful to the local communities and stakeholders who facilitated site accessibility and provided valuable insights into the landscapes surveyed.


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FOREWORD

Coimbatore stands at a pivotal crossroads with its Master Plan 2041, offering a unique chance to craft a sustainable, nature-positive city that inspires India and beyond. This vital WWF-India and Tamil Nadu Forest Department raptor assessment arrives at the perfect moment, revealing critical science: 78.6% of raptor sightings cluster in fragile edge habitats under urban pressure—our silent ecological guardians demand action now.

Tamil Nadu proves conservation and growth can thrive together. From Green Missions and coastal restorations to 20 Ramsar sites, India's first Dugong Reserve, and over 108 million trees planted under Honourable Chief Minister Thiru M.K. Stalin's vision, we've embedded climate resilience in governance. Our Forest Department's new Raptor Conservation Foundation drives focused research, monitoring, and community efforts to protect these vital species amid urban-nature interfaces.

This report goes beyond data—it's a practical roadmap. Protect key habitats, build ecological corridors, ensure bird-safe infrastructure, and reform waste practices; weave these into Coimbatore's Master Plan for biodiversity-rich growth. I commend the stellar collaboration of Forest Department, WWF-India, citizen scientists, and communities—true participatory governance.

Let's make Coimbatore a harmony of progress and heritage, where raptors soar over green corridors and wetlands power climate resilience. Today's choices shape a thriving legacy for generations.

(SUPRIYA SAHU)

RAKESH KUMAR DOGRA, IFS.,
Principal Chief Conservator of Forests &
Chief Wildlife Warden

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PREFACE

India's wildlife conservation has evolved toward landscape-scale strategies and community partnerships beyond protected areas. This report by Coimbatore Forest Division, and Raptor Conservation Programme, WWF-India integrates cutting-edge science into Coimbatore's urban framework, fostering human-wildlife coexistence.

As apex predators and scavengers, raptors regulate prey populations, remove disease-spreading carrion, and signal ecosystem vitality. Surveys across the Coimbatore Forest Division's seven ranges-leveraging eBird data and fieldwork-documented over 40 species, including threatened raptors flourishing in urban-forest ecotones.

Yet high raptor activity collides with expansion zones as Coimbatore's population approaches 3.2 million in 2026, set to surge by 2041. We advocate precautionary land-use planning to avert fragmentation, moving beyond species lists to science-driven decisions that preempt urban pressures.

This aligns with Tamil Nadu's initiatives, from wildlife corridors and bird-safe powerlines to NSAID restrictions safeguarding vultures. We propose an Urban Biodiversity Monitoring Cell to embed ecology within municipal and planning bodies.

Coimbatore stands poised to pioneer nature-positive urbanism, rallying citizens, schools, and developers around green resilience. This report establishes a baseline, urging stakeholders to make raptor conservation a city imperative.

(Rakesh Kumar Dogra)
Principal Chief Conservator of Forests &
Chief Wildlife Warden, Tamil Nadu

KEY MESSAGE

RAVI SINGH
Secretary General & CEO
WWF-India

As apex predators, raptors are indispensable to ecosystem stability. By regulating prey populations and maintaining ecological balance, they directly support public health, food security and urban resilience. Their presence — or decline — serves as a powerful indicator of the health of the landscapes and cities we share.

As Coimbatore moves toward rapid urban expansion, the city stands at a defining moment. Urban growth should be guided by ecological intelligence. The principles advanced by UN-Habitat — compact, green, resilient and inclusive development — remind us that biodiversity is an essential infrastructure. Integrating raptor habitats into city planning is not an environmental add-on; it is a strategic investment in long-term sustainability and climate resilience.

This study, undertaken in partnership with the Environment, Climate Change and Forest Department, Tamil Nadu, provides scientific evidence to inform nature-positive urban planning. This report identifies ecotones—transitional zones between forests and open landscapes that serve as vital forest buffers. Though limited in extent, these edge habitats function as biodiversity hotspots and ecological buffers. Their conservation should be embedded within land-use planning, zoning regulations, and urban expansion strategies to secure a resilient and liveable Coimbatore.

Our action framework calls for habitat-sensitive zoning, protection and restoration of important habitats, bird-safe infrastructure design and ecological monitoring integrated with smart city technologies. These measures align with the Sustainable Development Goals, particularly SDG 11 on Sustainable Cities and Communities and demonstrate how India can lead in advancing nature-based urban solutions.

By 2030, WWF-India aims to maintain and improve the integrity and connectivity of key ecosystems while enhancing the status of threatened species through an inclusive, science-based approach. Achieving this requires strong collaboration with urban planning authorities, municipal bodies, infrastructure agencies and communities to ensure biodiversity is embedded within master plans and governance frameworks.

I commend the Environment, Climate Change and Forest Department, Tamil Nadu, and our dedicated teams and volunteers for their leadership, technical expertise and steadfast commitment to advancing science-based conservation and integrating biodiversity into the future of urban development.

Ravi Singh
Secretary General & CEO
WWF-India

KEY MESSAGE

Dr Sejal Worah
Programme Director
WWF-India

Urbanisation is redefining India's ecological boundaries. As cities expand we need to ensure that we do not lose the natural systems that underpin ecosystem services, climate resilience and human well-being. The principles advanced by UN-Habitat — compact, green, resilient and inclusive cities — highlight the importance of embedding biodiversity considerations within urban planning processes.

Raptors, as apex predators and ecological sentinels, offer valuable insights into the health of peri-urban and urban ecosystems. Yet the habitat needs of birds of prey and other lesser-known species are not always explicitly reflected in urban master plans or zoning regulations. As cities revisit their growth trajectories, this may be an opportune time to elevate such species within land-use planning, infrastructure design standards, and environmental safeguards. Protecting ecotones, strengthening green-blue networks, and promoting bird-safe infrastructure can help align urban expansion with ecological integrity.

This report provides important information to support that shift. Notably, over 78% of raptor sightings were recorded in ecotones — transitional zones between forests and open landscapes. Though often underrepresented in spatial planning frameworks, these edge habitats function as biodiversity hotspots, ecological buffers, and climate moderators within rapidly transforming urban regions. Recognising and safeguarding such areas could significantly strengthen ecological connectivity and long-term urban resilience.

The findings of this study extend beyond Coimbatore and offer a replicable approach for other fast-growing cities. By integrating habitat-sensitive planning into Master Plan 2041 and related policy instruments, the state could demonstrate leadership in advancing nature-positive urbanisation.

Elevating raptors within urban discourse is not only about species conservation; it is about shaping cities that are healthier, more resilient, and better prepared for the future.

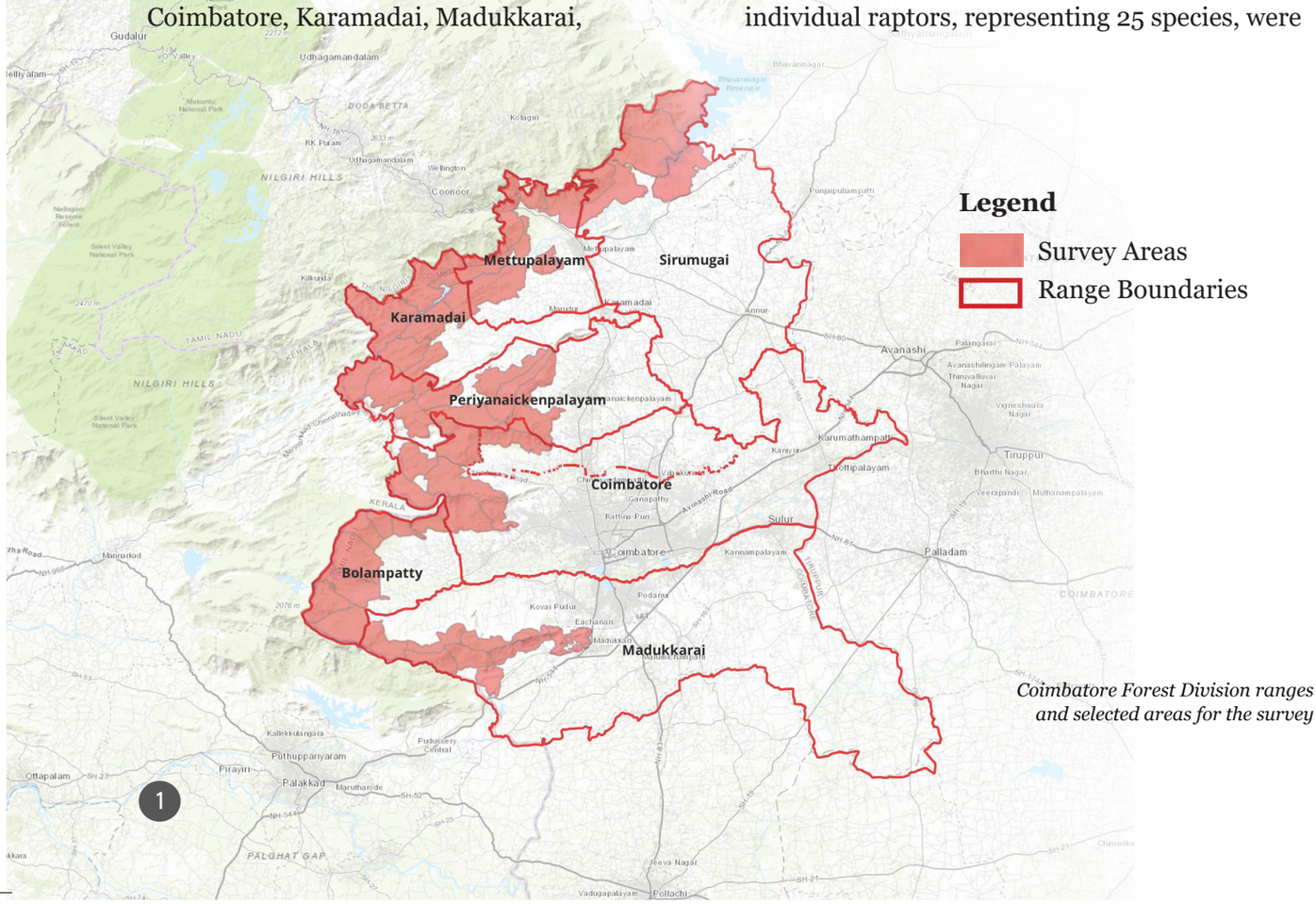
Dr Sejal Worah
Programme Director
WWF-India

1. EXECUTIVE SUMMARY

Raptors are vital for ecosystem health, functioning as predators and as scavengers that regulate populations of smaller mammals, reptiles, and insects while preventing the spread of diseases. In a city like Coimbatore, which lies at the intersection of the Western Ghats and a rapidly expanding urban landscape, raptors are not only important for biodiversity but also serve as indicators of environmental health. Despite their ecological significance, systematic information on raptor populations in this region remains limited, highlighting the urgent need for focused research to determine their distribution, abundance, and habitat preferences. This survey was designed to address this gap by establishing baseline data to inform conservation planning and identify priority areas for raptor habitat management.

The survey was conducted across seven ranges of the Coimbatore Forest Division— Bolampatty, Coimbatore, Karamadai, Madukkarai, Mettupalayam, Periyanaickenpalayam, and Sirumugai in two phases. In the first phase, eBird data (2021-2025) were analysed to provide an overview of raptors in the landscape. The eBird data analysis documented 5,086 raptor sightings representing 43 species across the study area. Spatial analysis revealed significant variation in raptor abundance, with the Coimbatore range recording the highest diversity (33 species) and sightings (3,082). The shikra (*Tachyspiza badia*) was the most frequently observed species (1,404 sightings). Habitat analysis indicated strong preferences for rangeland and tree-dominated areas.

Field surveys were conducted over two days in February 2025 to validate and ground-truth the findings. Approximately 300 km of transects were covered, representing at least 30% of the habitat in each range, along with 47 focal counts in areas inaccessible by vehicles. A total of 202 individual raptors, representing 25 species, were



Coimbatore Forest Division ranges and selected areas for the survey

recorded. Bolampatty, Madukkarai, Karamadai and Sirumugai emerged as key habitats, with Bolampatty hosting the highest species richness. The most commonly observed raptor species were the shikra (*Tachyspiza badia*), Brahminy kite (*Haliastur indus*), and crested serpent-eagle (*Spilornis cheela*).

A significant finding of the study was the strong association between raptors and ecotones, which are the transition zones between different habitat types. Analysis focused on transition zones between tree-dominated areas and rangeland which revealed a marked preference for ecotone habitats, with 78.6% of eBird records and 85.1% of field survey observations occurring in these areas—despite ecotones representing only a small fraction of the landscape. This underscores their ecological importance for raptors. Raptors were observed utilising these areas for perching, feeding, and potentially nesting, which underscores their ecological importance. In Coimbatore's fast-changing landscape, these insights are particularly critical.

The Coimbatore Master Plan 2041 envisions major urban expansion into peri-urban and forest-adjacent areas, many overlapping with ecologically significant raptor habitats identified in this study. Without safeguards, such expansion risks habitat fragmentation, disruption of movement paths, and loss of critical edge habitats essential for sustaining raptor populations.

This report aims to elevate raptors and integrate their conservation into the centre of urban ecological planning in Coimbatore. It provides a foundation for incorporating raptor-sensitive considerations into the Master Plan 2041 by providing new insights into their habitat use, especially near ecotones. The findings call on planners and decision- makers to integrate ecological buffers, conserve edge habitats, and adopt design approaches that work with nature. Through these steps, Coimbatore has the opportunity to lead by example in embedding biodiversity into the core of its urban growth narrative.

HIGHLIGHTS

eBird Data Analysis

2021-2025 eBird data

5086 raptor sightings

43 raptor species

1404 shikra
Species with the highest number of sightings

78.6% of raptor sightings in the ecotone region

Field Survey

≈300 km of transects, **47** focal counts

202 raptor sightings

25 raptor species

31 shikra
Species with the highest number of sightings

85.1% of raptor sightings in the ecotone region

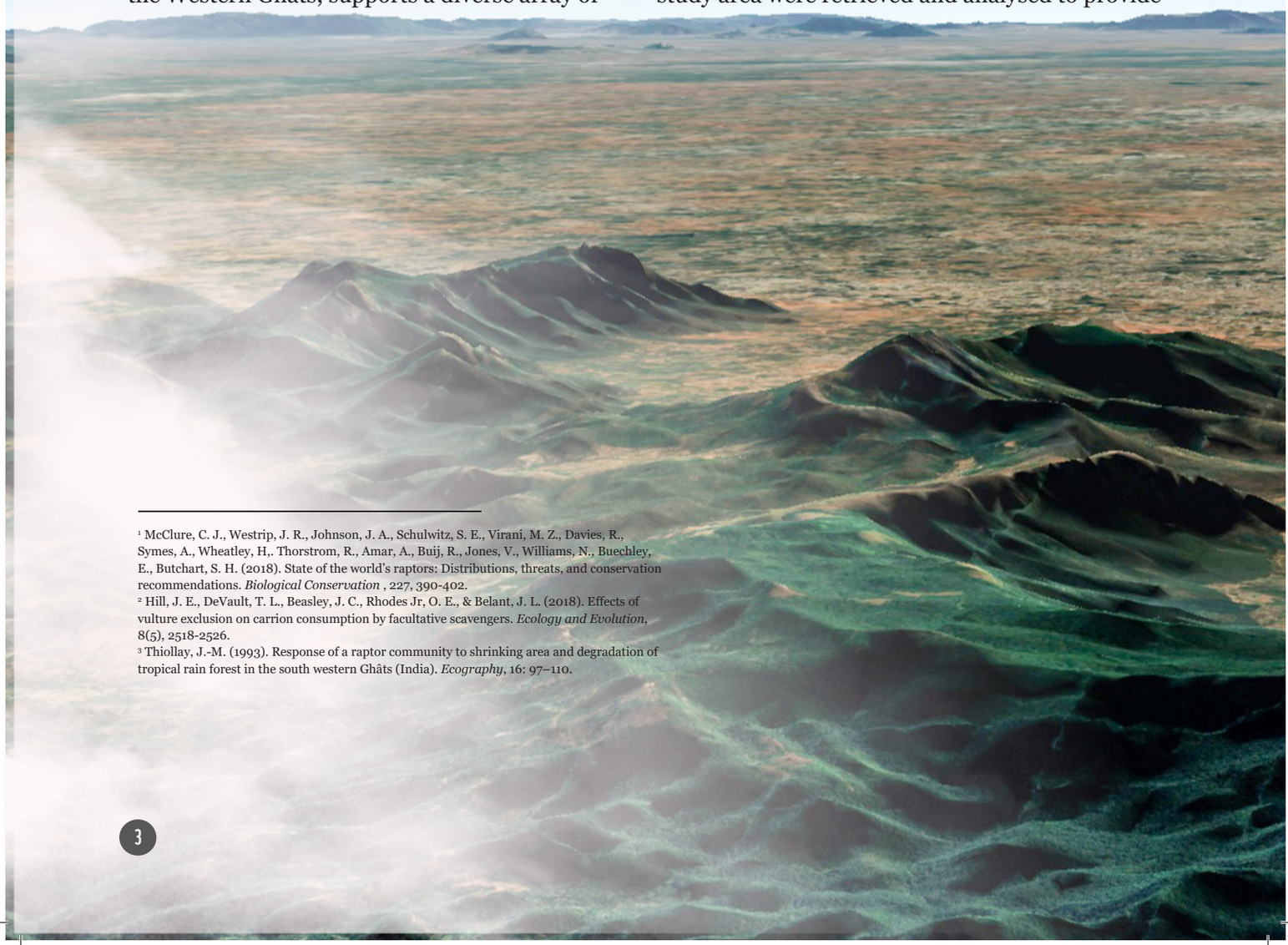
- The ecotone areas of Coimbatore are facing increasing pressure from urban development, with further expansion planned as part of the Master Plan 2041.
- Integrating raptor-sensitive measures into urban planning can position raptors as vital ecological indicators at the core of Coimbatore's sustainable growth.

2. BACKGROUND

Raptors play an important role in maintaining ecosystem health by providing essential regulatory services[1]. As apex predators and scavengers, they help control populations of small mammals, reptiles and insects, while vultures significantly contribute to disease regulation by efficiently consuming carrion and limiting the spread of pathogen[2]. However, their specialised habitat requirements and relatively small populations make them vulnerable to changes in the environment. In regions such as the Western Ghats, changes in land-use have negatively impacted the raptor populations, diminishing their ecological roles and exacerbating human-wildlife conflict[3].

The Coimbatore Forest Division, located in the Western Ghats, supports a diverse array of raptors that contribute to maintaining ecological balance. Despite their ecological importance, systematic data on the distribution, abundance, and habitat use of raptors in the Coimbatore region remain scarce. This knowledge gap limits the ability to design targeted conservation strategies and hinders the integration of biodiversity considerations into spatial and development planning.

An assessment was undertaken to address the knowledge gap across all seven ranges in the division. The objectives were to document species richness and abundance, identify key habitats, and understand habitat preference by raptors across the landscape. The study was conducted in two phases. First, eBird data (2021-2025) for the study area were retrieved and analysed to provide



[1] McClure, C. J., Westrip, J. R., Johnson, J. A., Schulwitz, S. E., Virani, M. Z., Davies, R., Symes, A., Wheatley, H,. Thorstrom, R., Amar, A., Buij, R., Jones, V., Williams, N., Buechley, E., Butchart, S. H. (2018). State of the world's raptors: Distributions, threats, and conservation recommendations. *Biological Conservation* , 227, 390-402.

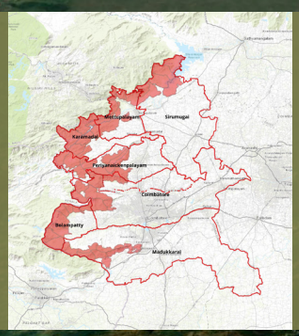
[2] Hill, J. E., DeVault, T. L., Beasley, J. C., Rhodes Jr, O. E., & Belant, J. L. (2018). Effects of vulture exclusion on carrion consumption by facultative scavengers. *Ecology and Evolution*, 8(5), 2518-2526.

[3] Thiollay, J.-M. (1993). Response of a raptor community to shrinking area and degradation of tropical rain forest in the south western Ghâts (India). *Ecography*, 16: 97–110.

an overview of raptor presence. These findings were validated through a comprehensive field survey carried out across the same seven ranges of the division. The field data was analysed to corroborate and refine the results, ensuring a robust understanding of raptor presence and habitat use.

A key focus of the study was the role of ecotones—transition zones between different natural habitats and modified landscapes. Several types of ecotones exist; this study focused on the transition zones between tree-dominated areas and rangelands, where over 80% of sightings were recorded. Analysis revealed that these edge habitats support disproportionately high raptor abundance and species diversity, underscoring their ecological importance in mosaic and peri-urban areas. The insight gains added significance in the context of Coimbatore's Master Plan 2041, which anticipates substantial urban expansion. Many of the areas identified as ecologically important for raptors, particularly ecotones, overlap with zones earmarked for infrastructure development and urban growth. Without adequate safeguards, such expansion risks fragmenting critical habitats, severing ecological corridors, and further pressuring already vulnerable raptor populations.

The ecological insights generated through this assessment would provide a stronger foundation for integrating raptor conservation into regional planning frameworks. The evidence could guide land-use zoning, define ecological buffers, and inform nature-sensitive infrastructure development. Future seasonal surveys will build on this baseline, enabling planners and decision-makers to align Coimbatore's urban growth with long-term ecological sustainability.



Location

Coimbatore Forest Division

latitudes 10°51’ and 11°27’N
longitudes 76° 39’ and 77° 4’E

Elevation Range

1950 m

450 m

Temperature Range

41°C Highest recorded

12°C Lowest recorded

Forest

Urban settlement

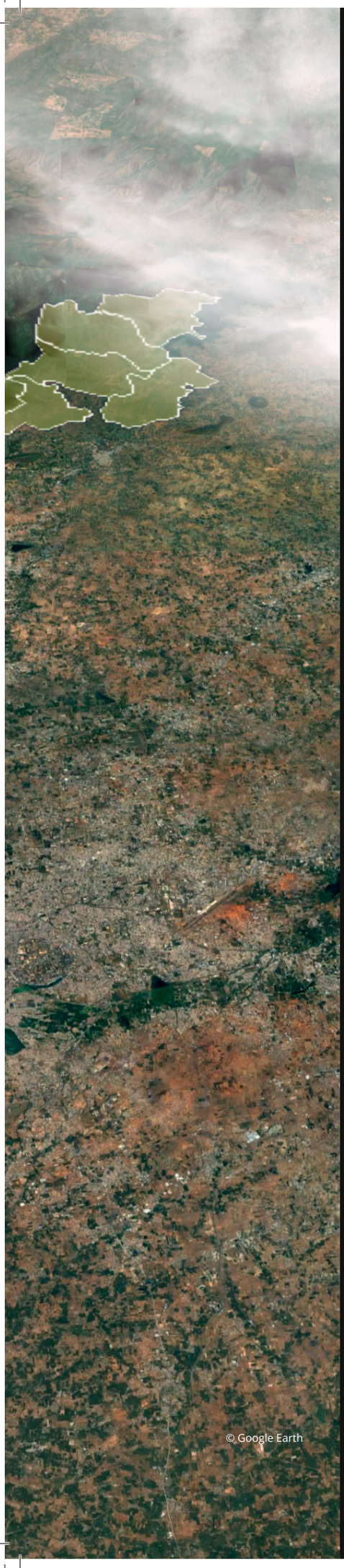
N

9 km

Google Earth

Image Landsat / Copernicus

Map 1. Surveyed areas of the Coimbatore Forest Division



3. PROJECT AREA

The Coimbatore Forest Division (CFD) is an ecologically significant region situated in the western part of Tamil Nadu and forms part of the Nilgiri Biosphere Reserve. It lies between latitudes 10°51' and 11°27'N and longitudes 76° 39' and 77° 4'E, encompassing a diverse range of habitats that support rich biodiversity. The division is divided into seven ranges, each exhibiting distinct geographical and ecological features: Bolampatty, Coimbatore, Karamadai, Madukkarai, Mettupalayam, Periyanaickenpalayam, and Sirumugai[4]. The survey was conducted in the selected beats of the seven ranges.

Several major reserve forests, including Amaravati, Manjampatti, Anaimalai, Kudirarar/Kookal are located within the Coimbatore district. The region experiences a prolonged moist period of nine months, which supports dense forest cover across various soil types[5]. Mean maximum and minimum temperatures range from 35°C to 18°C during summer and winter, respectively. The highest temperature ever recorded was 41°C and lowest and lowest was 12°C in this region[6]. CFD is supported by two major rivers, Bhavani and Noyyal, along with the Alaiyar and Kousika rivers. The elevation ranges from 450 m to 1950 m, resulting in diverse microhabitats that influence species distribution. Historical data from 1916 to 2015 indicated an upward trend in rainfall during the Northeast Monsoon (NEM) season, along with an increase in the number of rainy days[7].

The Coimbatore Local Planning Area (LPA) spans 1,531.57 sq km and includes 1 municipal corporation, 4 municipalities, 21 town panchayats, and 66 revenue villages. According to the 2011 Census, the LPA had a population of 2,457,452 with 1,584,719 residing in the Corporation area, which covers 257.81 sq km. Population density within the LPA is 16 persons per hectare, increasing to 61 persons per hectare in the Corporation area, indicating high urban concentration within a heterogeneous settlement landscape[8].

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[4] Ramkumar, K., Balasundaram, R., & Saravanamuthu, S. R. (2014). Crop damage by Asian elephants *(Elephas maximus)* and effectiveness of mitigating measures in Coimbatore Forest Division, South India. *International Research Journal of Biological Sciences*, 3(1), 1–11.

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4. METHODS

The study was designed in two phases to combine citizen science data with systematic field surveys, ensuring both broad spatial coverage and on-ground validation.

Phase I: eBird Data Analysis

Raptor observation records for the project area were retrieved from the eBird database (2021-2025) and systematically analysed. The dataset was used to quantify species richness, abundance, spatial distribution, and habitat associations within the project area.

Phase II: Field Surveys

Comprehensive field surveys were undertaken for two days in February 2025 across Bolampatty, Coimbatore, Karamadai, Madukkarai, Mettupalayam, Periyanaickenpalayam, and Sirumugai ranges. Project area coverage in each range was ensured through vehicle-based road transects, covering approximately 300 km and at least 30% of the habitat per range. Additionally, 47 fixed-point focal counts were conducted in areas without motorable access. Each focal count lasted 30 minutes and was scheduled during peak raptor activity periods to maximise detection probability.

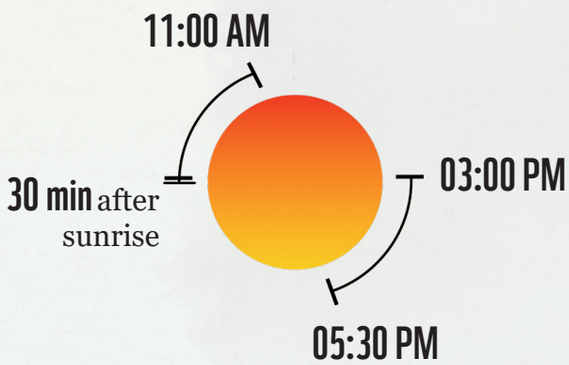
TOOLS AND TECHNIQUES

Transects and focal survey points

Road transect: Longer line transects (<5 km)
Covered at least 30% of all habitats
Fixed counts in the important habitat areas

Survey timings & documentation

Peak activity hours
30 minutes after sunrise till 11.00 am &
03.00 pm to 05.30 pm



SURVEY TEAM

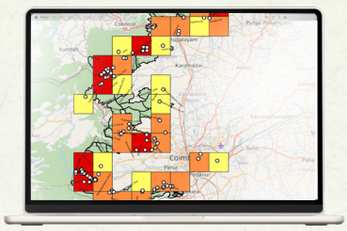
7 Teams were formed (one team per range)

- Frontline staff - Coimbatore Forest Division, WWF-India staff and bird experts
- Bird experts and nature guides from Tamil Nadu/Kerala were engaged

III GIS ANALYSIS

Spatial analysis

- Spatial analysis utilised a 5 × 5 km grid system across the study area.
- Raptor observation points were overlaid to quantify sightings per grid.
- Each grid was classified using the quantile method* based on the number of raptor sightings. Categorisation -
  - Low Raptor Sighting Grids
  - Medium Raptor Sighting Grids
  - High Raptor Sighting Grids



Habitat use analysis

- GPS locations recorded overlaid on LULC data from Sentinel-2 (2024)
- Analysed in QGIS 3.40.1 to obtain preliminary insights on habitat preferences
- Ecotone (Edge analysis) of eBird data (2021-2025) and field survey data by chi-squared goodness-of-fit test were performed in R software version 4.5.1

*The quantile method is a statistical approach that divides data into equal-sized groups based on their distribution, allowing for clear categorisation of observation intensity.

IV OBSERVATIONS DOCUMENTED

Raptor species with number of sightings

Raptor behaviour
(e.g., perching, soaring, hunting, nesting, etc.)

Age, sex, plumage

Habitat of the raptor sighted

Weather and visibility conditions

GPS location

Critical threats

5. RESULTS AND DISCUSSION

5.1 Phase I - Analysis of eBird Data

5.1.1 Raptor Species Diversity and Status

The eBird analysis documented 5,086 raptor sightings of 43 species across the project area. Of these, two species were Critically Endangered (CR), three were Vulnerable (VU), five were Near Threatened (NT), and the remainder were classified as Least Concern (LC) according to International Union for Conservation of Nature (IUCN).

Population trends* of the observed species, based on the State of India's Birds (SoIB) report, were as follows: eight Stable (S), eight Rapid Decline (RD), nine Decline (D), three Insufficient Data (ID), nine Not Known (NK), and six Trend Inconclusive (TI) (Annexure 3).

5086 Sightings — **43** Species

IUCN status

2 Critically Endangered (White-rumped vulture and long-billed vulture)

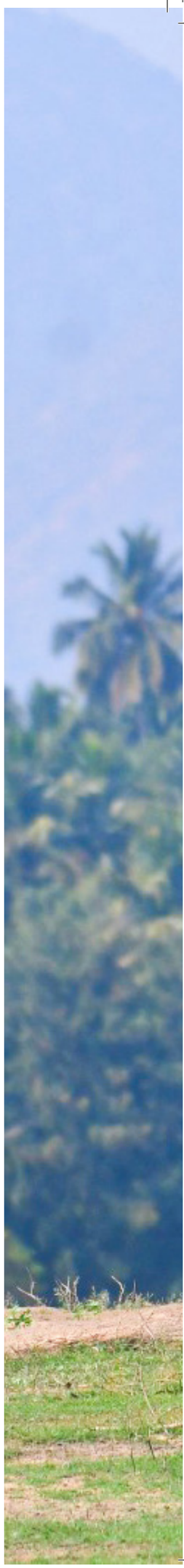
3 Vulnerable (Greater spotted-eagle, Indian spotted-eagle, and tawny fish-owl)

SoIB Trend

Rapid Decline
White-rumped vulture, long-billed vulture, marsh harrier, pallid harrier, Montagu's harrier, short-toed snake-eagle, osprey, and Eurasian kestrel

Decline
Changeable hawk-eagle, crested goshawk, common buzzard, red-headed falcon, peregrine falcon, Eurasian sparrowhawk, black-winged kite, black eagle and brown fish-owl

*SoIB defines population trend as 'index of abundance', derived from the frequency of species reporting. By tracking changes in reporting frequency over several years, population trend is estimated.



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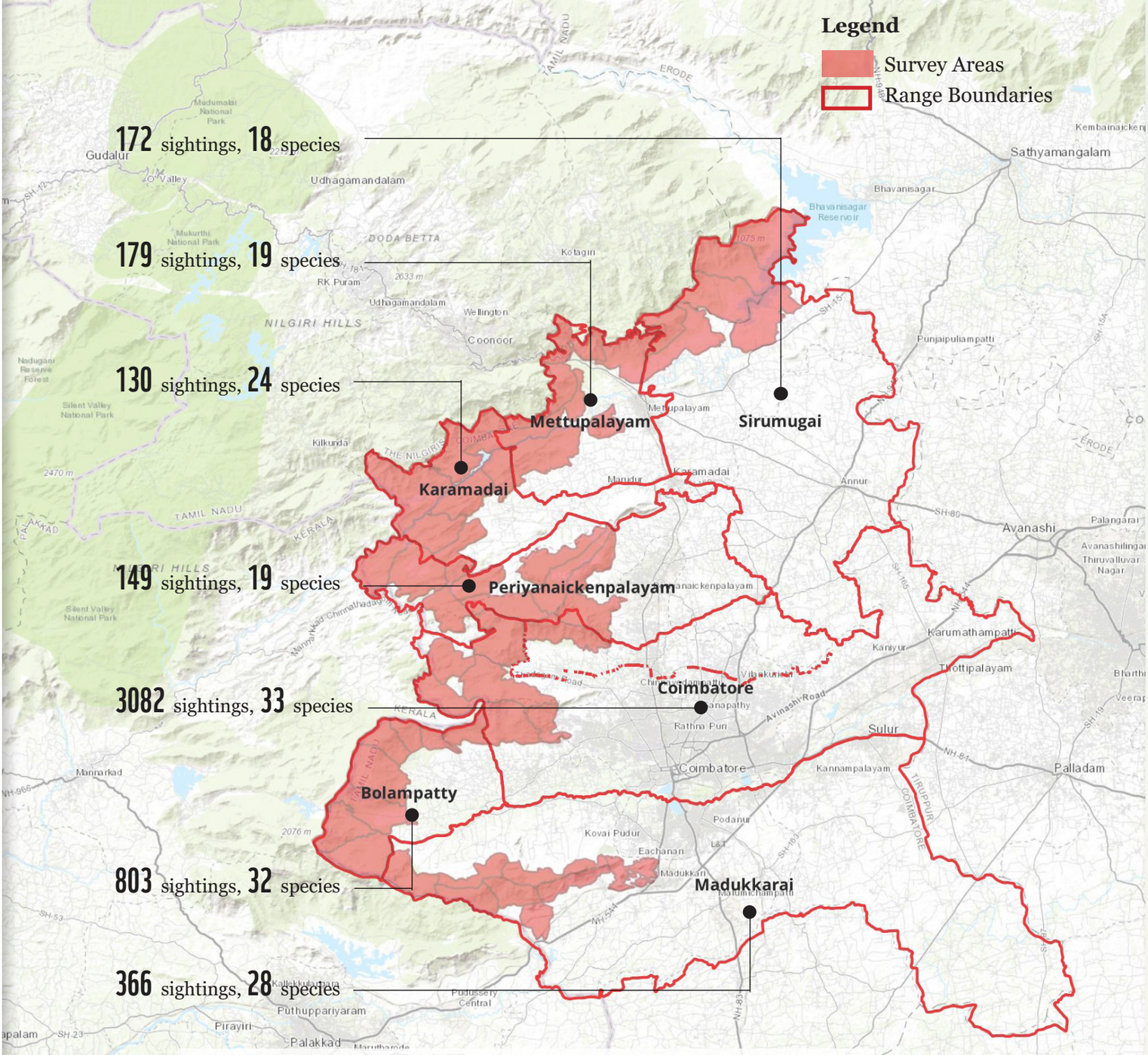
5.1.2 Species Diversity Across Survey Ranges

The Coimbatore range recorded the highest number of sightings (3,082) and the greatest species richness (33). Bolampatty and Madukkarai ranges followed, ranking high in both abundance and diversity. In contrast, Periyanayakanpalayam and Sirumugai ranges recorded the lowest counts and species richness. The remaining ranges showed moderate levels of both sightings and species representation.



Map 2. Number of raptor sightings and diversity across the project area (eBird Data 2021-2025)

5.1.3 Species Abundance

The analysis recorded variation in raptor abundance (Figure 1). The shikra (*Tachyspiza badia*) was the most frequently observed species, with 1404 sightings, followed by spotted owlet (*Athene Brama*) at 671 sightings, 636 sightings of oriental honey-buzzard (*Pernis ptilorhynchus*), 466 sightings of crested serpent-eagle (*Spilornis cheela*), and 367 sightings of the black eagle (*Ictinaetus malaiensis*). Several species, including grey-headed fish-eagle (*Haliaeetus ichthyaetus*), Indian spotted eagle (*Clanga hastata*), lesser kestrel (*Falco naumanni*), and Indian vulture (*Gyps indicus*), were recorded only once, indicating low abundance (Figure 1).

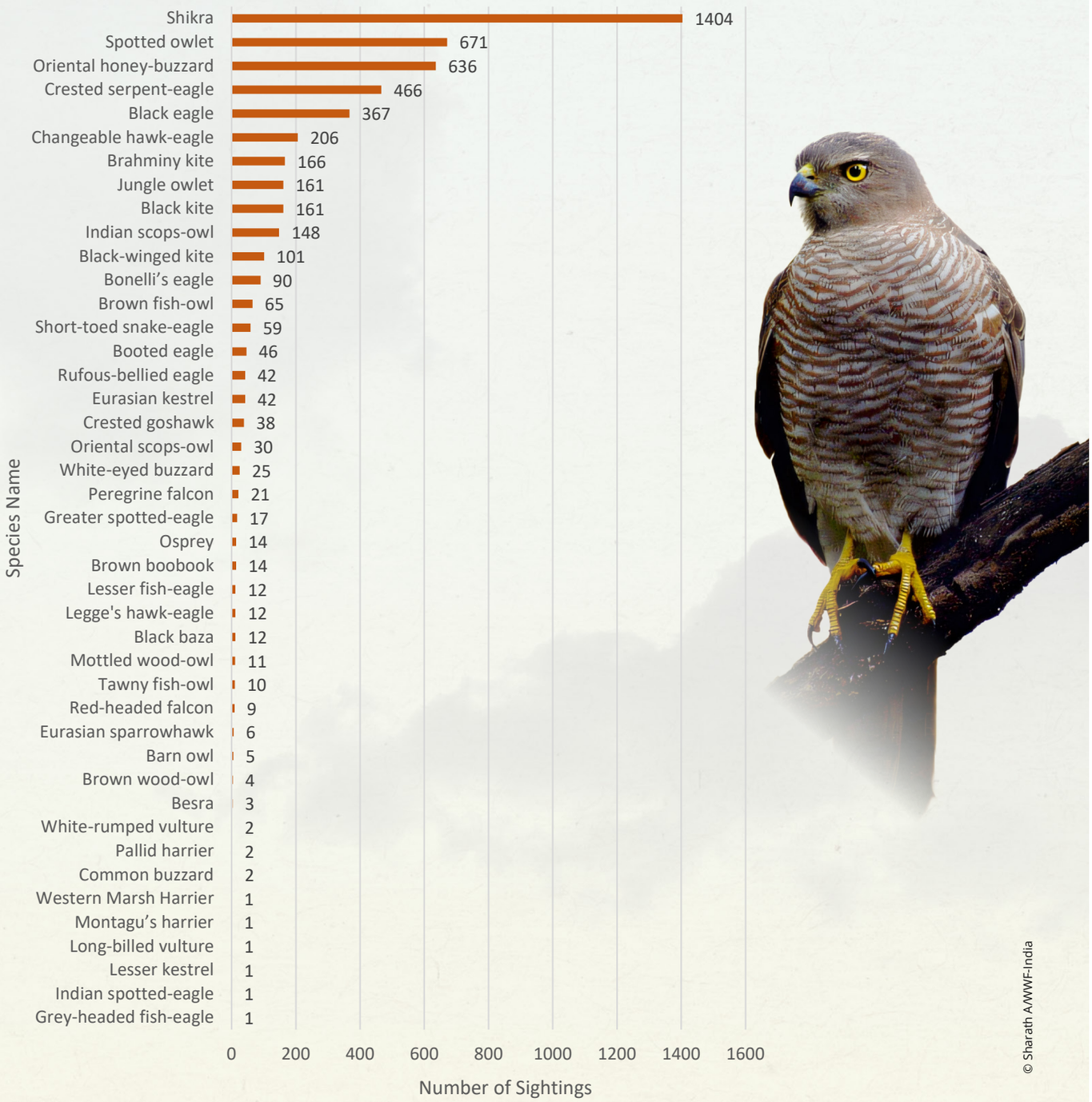


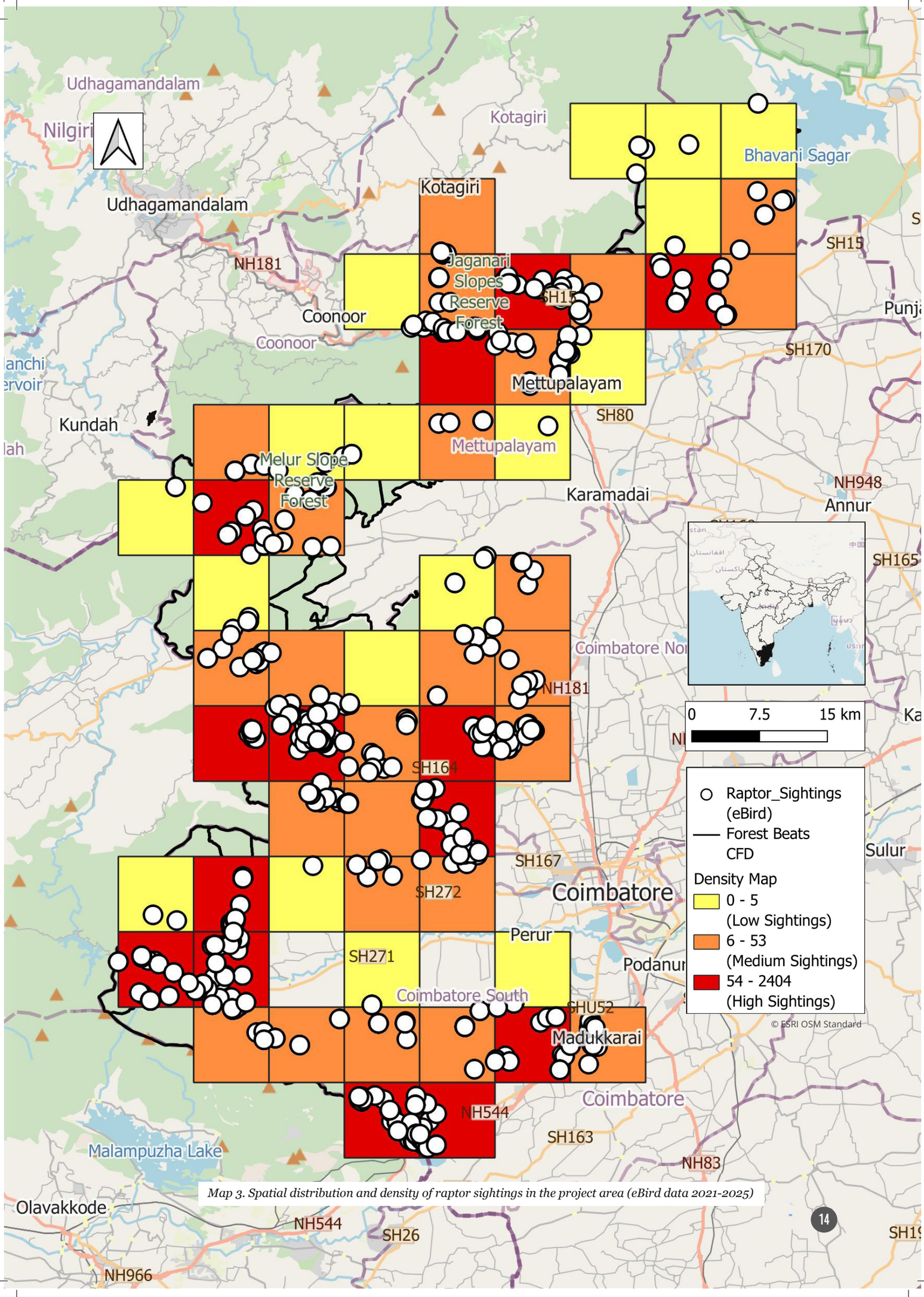
Figure 1. Abundance of raptor species observed during surveys in the project area (eBird data 2021-2025)

5.1.4 Spatial Patterns of Raptor Sightings

Grids were classified into three categories using the Quantile method: Low (0–5 sightings), Medium (6–53 sightings), and High (53–2404 sightings) based on recorded raptor sightings. Analysis of the spatial distribution revealed 14 grids with High sightings, 25 grids with Medium sightings, and 17 grids with Low sightings (Map 3).

The High sighting grids were predominantly located in Sirumugai, Mettupalayam, Madukkarai, Karamadai, Coimbatore, and Bolampatty ranges with the highest frequency observed in Coimbatore (4 grids), Madukkarai (3 grids), and Bolampatty (3) ranges. Land Use and Land Cover (LULC) assessment of these grids indicated that tree-dominated areas constituted the majority of the landscape (51%), followed by rangeland (22%) and cropland (18%). Built-up areas accounted for 8%, with water bodies and minor land-use types making up the remainder. These results suggests that raptors preferred habitats with substantial tree cover and open rangeland.

Medium-sighting grids were distributed across Sirumugai (3), Periyanaickenpalayam (5), Mettupalayam (4), Madukkarai (5), Karamadai (2), and Coimbatore (6) ranges. Low-sighting grids were distributed across Sirumugai (5), Periyanaickenpalayam (3), Mettupalayam (3), Madukkarai (1), Karamadai (2), and Bolampatty (2) ranges.



Map 3. Spatial distribution and density of raptor sightings in the project area (eBird data 2021-2025)

5.1.5 Habitat Preference by Raptors

Raptor distribution varied markedly across habitat types. Rangelands were the most intensively used, accounting for 57% of 5086 sightings supporting 32 species. Tree-dominated areas exhibited the highest species richness, with 37 species and 31% of the total sightings, highlighting their importance for forest-dependent raptors such as Legge's hawk-eagle (*Nisaetus kelaarti*) and brown fish-owl (*Ketupa zeylonensis*).

Croplands hosted 34 species and 9% of the total sightings, indicating their role as valuable supplementary habitats for both resident and seasonal raptors. Built-up environments supported 18 species making up 3% of the total sightings, water habitats accounted for only 1% of the total sightings but supported 10 specialised species, including water-body dependent raptors such as the osprey (*Pandion haliaetus*) and grey-headed fish-eagle (*Haliaeetus ichthyaetus*), illustrating the unique ecological value of nature of aquatic-associated raptor communities (Figure 2 & Map 4).

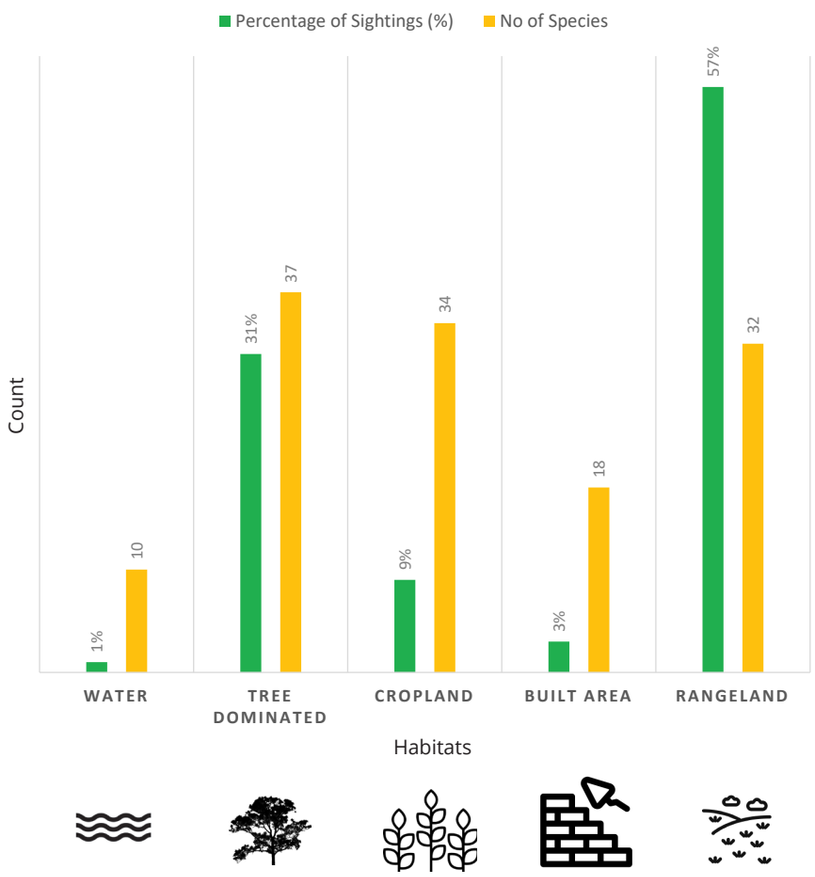
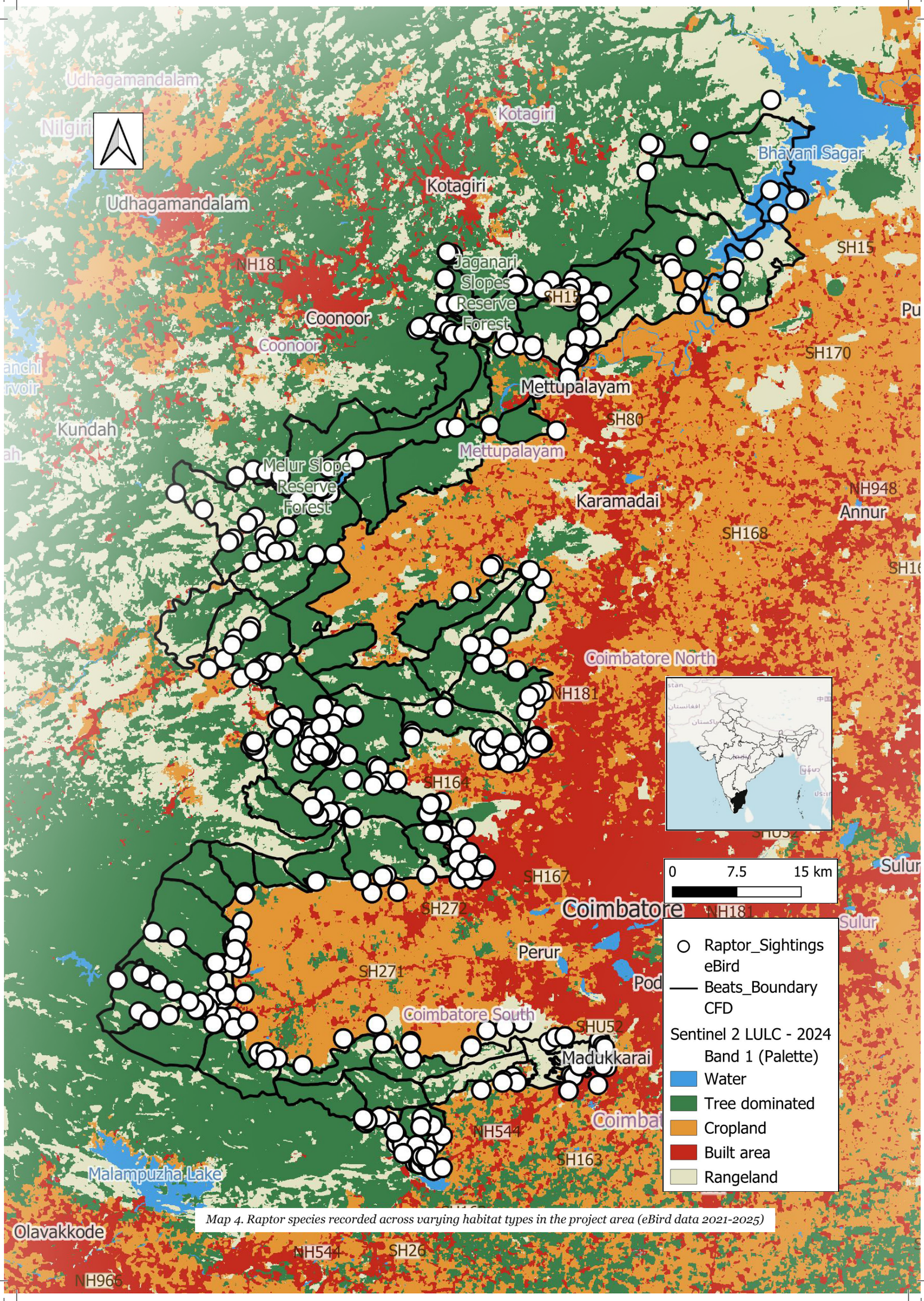


Figure 2. Percentage of raptor sightings and number of species observed in various habitat types in the project area (eBird data 2021-2025)



Map 4. Raptor species recorded across varying habitat types in the project area (eBird data 2021-2025)

5.1.6 Ecotones Preferences by Raptors

The eBird data analysis also examined whether raptors exhibit a preference for ecotones, which are the transitional zones between distinct habitat types, compared to other available habitats. Ecotones, such as tree-dominated and rangeland edges, often provide structural heterogeneity and diverse foraging opportunities, which are especially important for many raptor species.

A chi-square goodness-of-fit test was used to compare the observed number of raptor sightings within ecotone areas against expected sightings under a random distribution model*, proportional to habitat availability. Spatial data, including forest boundaries, delineated ecotone zones, and raptor sightings from five years of eBird records, were analysed.

The results demonstrated a significant preference for ecotone zones, with 3,998 of 5,086 sightings (78.6%) occurring within these areas. Considering the proportion of ecotone area in the landscape, only 2,979 sightings were expected (Figure 3 & Map 5). This difference was statistically significant (χ^2 test, $p < 0.001$), indicating that raptors utilise ecotones more than other habitats.

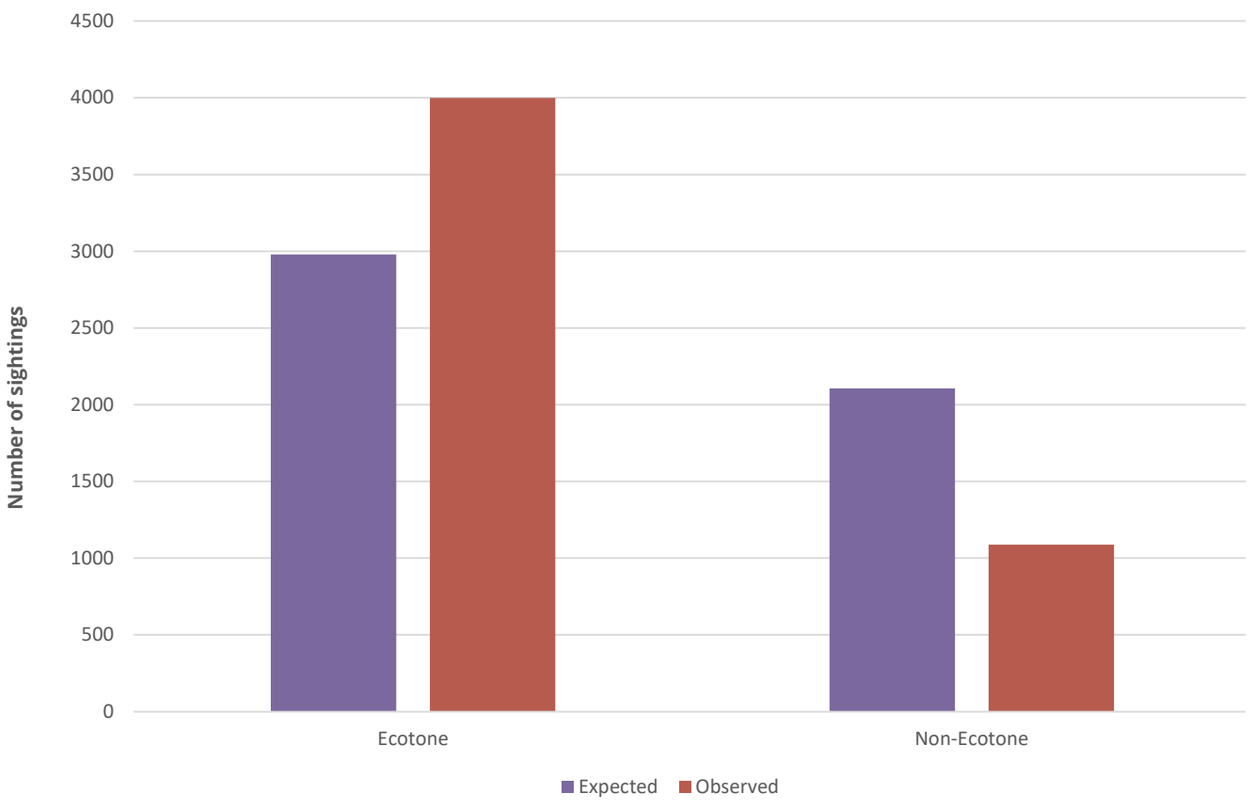
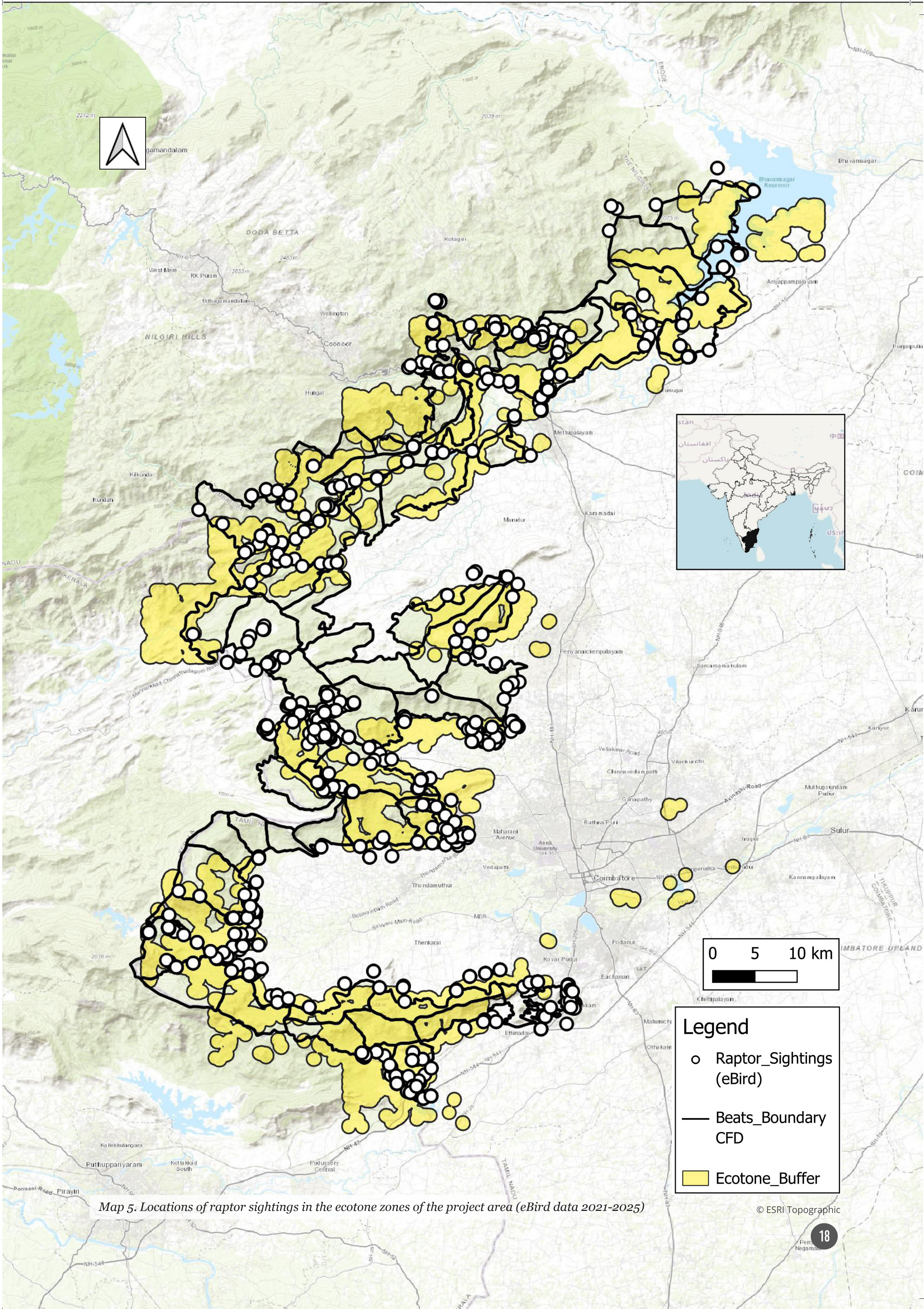


Figure 3. Expected and observed raptor sightings in ecotone and non-ecotone zones (eBird data 2021-2025)

* The Random Distribution Model assumes that sightings occur randomly across habitats based on their availability, providing a no expectation to identify whether species show preference or avoidance to particular habitats.



Map 5. Locations of raptor sightings in the ecotone zones of the project area (eBird data 2021-2025)

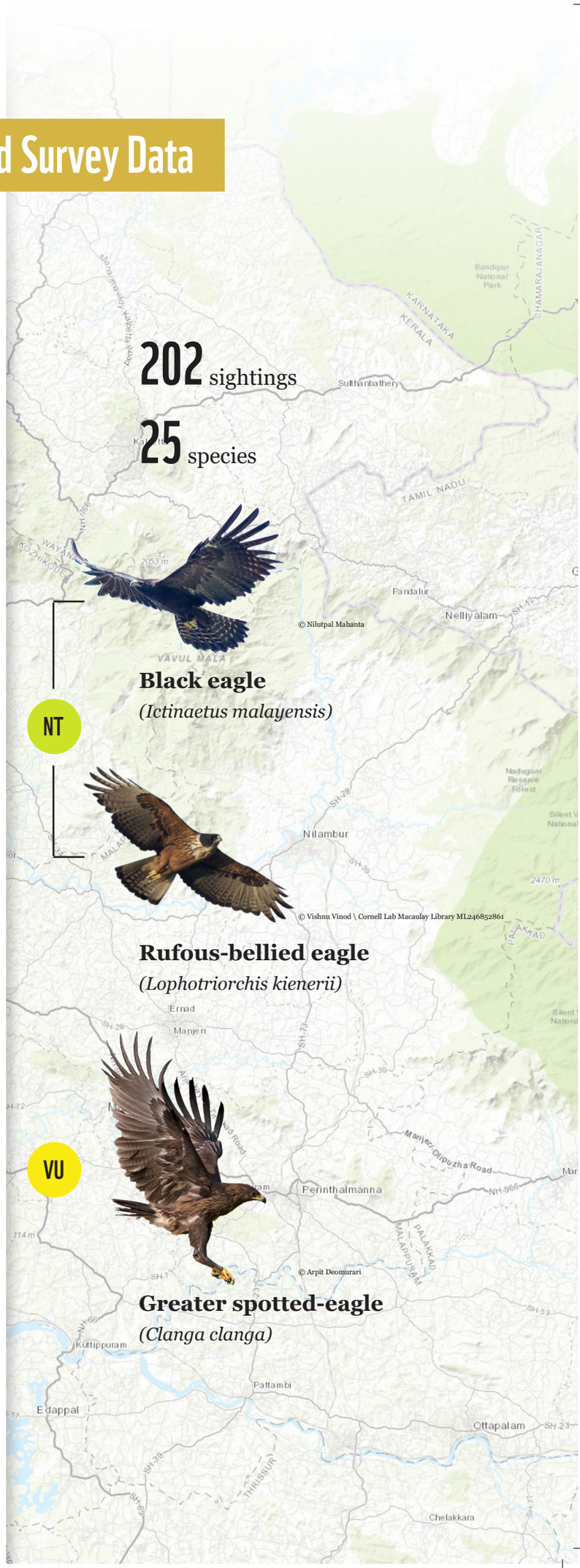
© ESRI Topographic

5.2 Phase II - Analysis of Field Survey Data

5.2.1 Raptor Status and Species Diversity

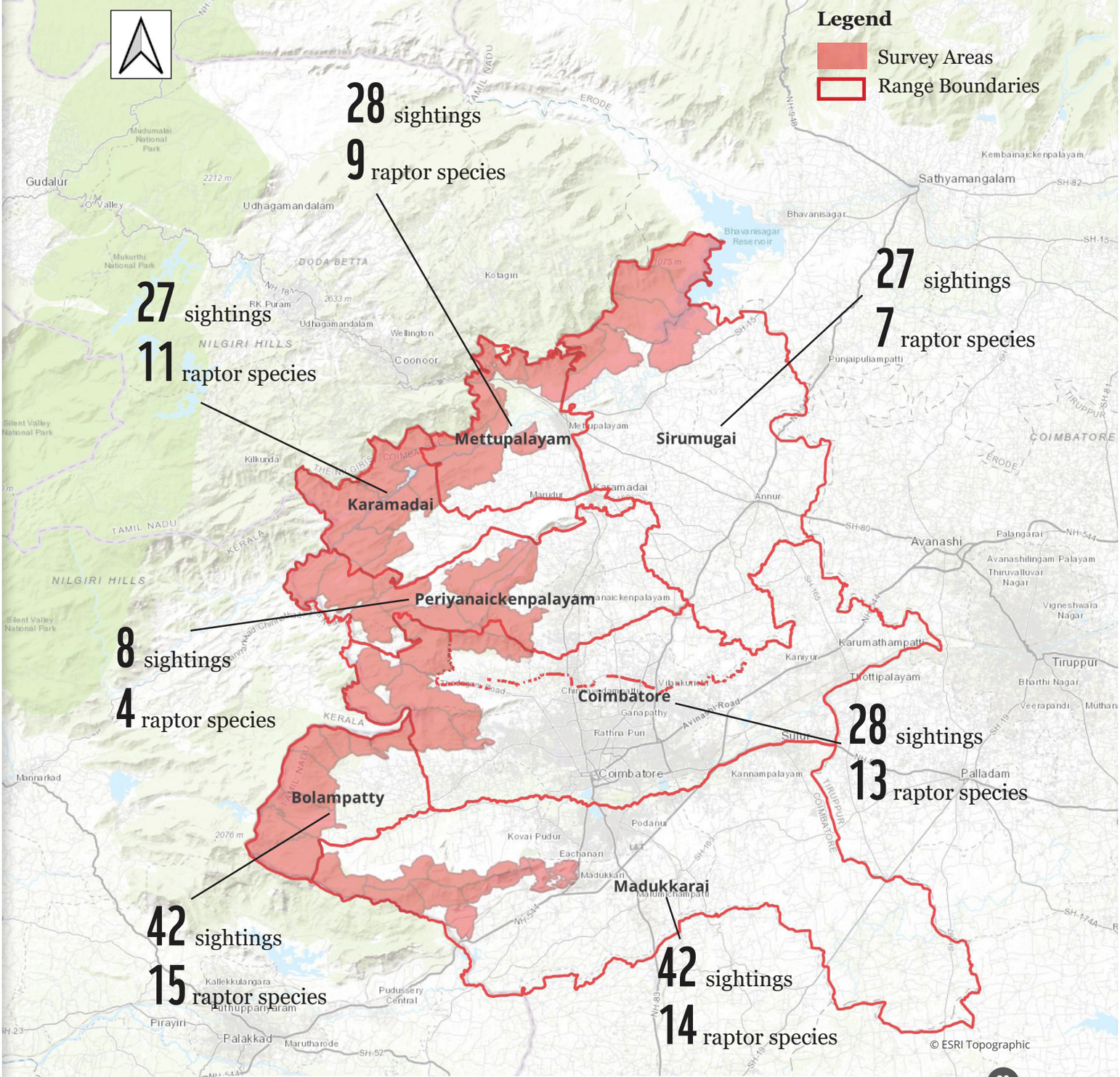
The field survey recorded 202 individual raptor sightings, representing 25 distinct species (Annexure 1). These belonged to three orders and four families: Accipitriformes (Accipitridae and Pandionidae), Falconiformes (Falconidae), and Strigiformes (Strigidae). Of the 25 species, 21 were classified as Least Concern (LC) by the IUCN. The black eagle (*Ictinaetus malayensis*) and rufous-bellied eagle (*Lophotriorchis kienerii*) were listed as Near Threatened (NT), and the greater spotted-eagle (*Clanga clanga*) as Vulnerable (VU). No Critically Endangered (CR) or Endangered (EN) species were observed.

According to State of India's Birds (SoIB) population trend, eight species showed stable (S) trends, while 11 species had insufficient or unclear data (NK/ID/TI). Short-toed snake eagle (*Circaetus gallicus*), osprey (*Pandion haliaetus*), Eurasian kestrel (*Falco tinnunculus*) showed Rapid Decline (RD) trends, whereas black-winged kite (*Elanus caeruleus*), and brown-fish-owl (*Ketupa zeylonensis*) showed decline (D). In contrast, the jungle owlet (*Glaucidium radiatum*) displayed an Increasing (I) trends (Annexure 1).



5.2.2 Species Diversity Across Survey Ranges

Species diversity varied considerably across survey ranges. The highest number of sightings (42 each) were recorded in the Bolampatty and Madukkarai ranges, while the lowest was noted in Periyanaickenpalayam range with eight sightings. Bolampatty range recorded the highest diversity (15 species), followed by Madukkarai range (14 species), and Coimbatore range (13 species). In contrast, Periyanaickenpalayam range had the lowest richness with 4 species recorded (Map 6 & Annexure 2).



Map 6. Number of raptor sightings and species richness recorded during the survey

5.2.3 Species Abundance

Among all observed species, the shikra (*Tachyspiza badia*) had the highest number of sightings (n=31), followed by the Brahminy kite (*Haliastur indus*) (25) and crested serpent-eagle (*Spilornis cheela*) (24). Spot-bellied eagle-owl (*Bubo nipalensis*) and white-eyed buzzard (*Butastur teesa*) were recorded only once. Meanwhile, species like the oriental honey-buzzard (*Pernis ptilorhynchus*) (18) and changeable hawk-eagle (*Nisaetus cirrhatus*) (17) were observed with moderate frequency (Figure 4).

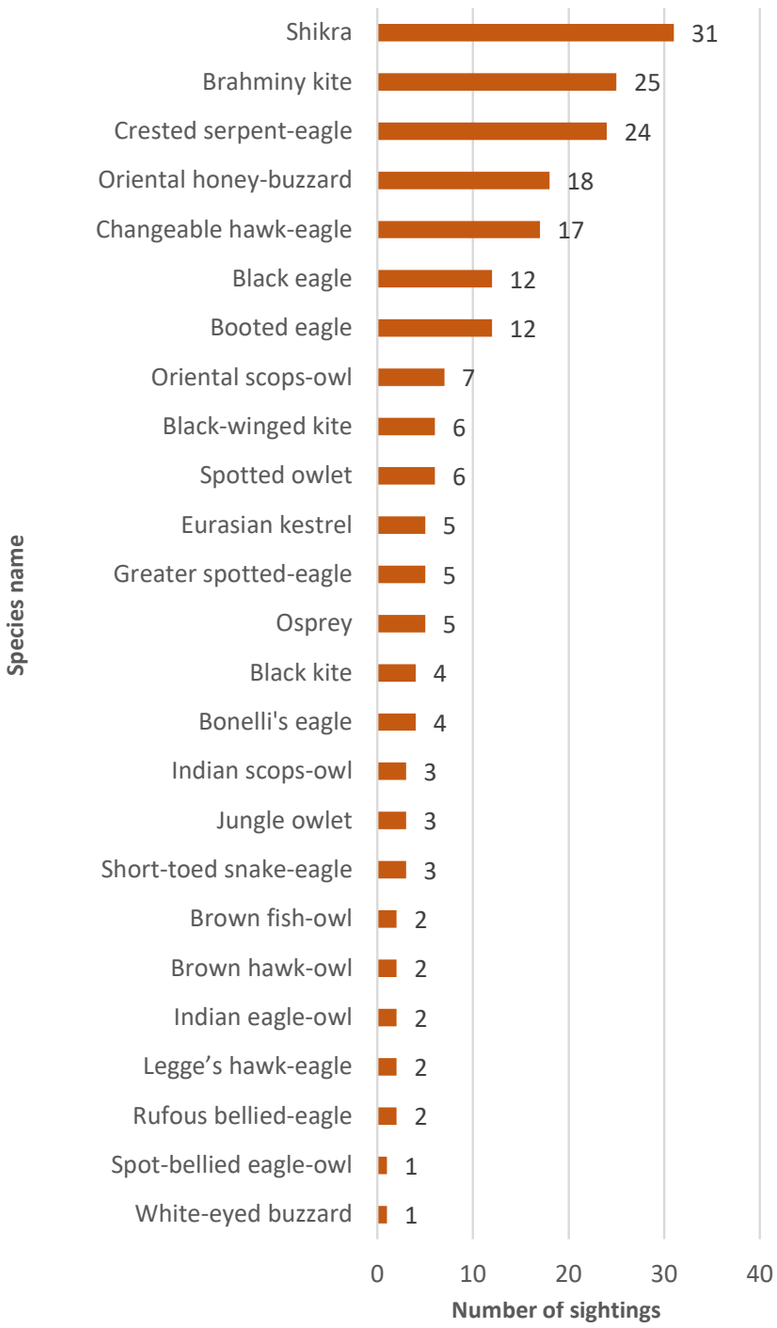


Figure 4. Abundance of raptor species recorded during the survey

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5.2.4 Spatial Patterns of Raptor Sightings

Raptor sightings documented in the field surveys were classified into three categories using the Quantile method: Low (0–1 sightings), Medium (2–8 sightings), and High (9–25 sightings). The classification identifies eight grids with high raptor sightings, 17 grids with medium sightings, and 11 grids with low sightings (Map 7).

High Sighting Grids

The high raptor sighting grids are concentrated mainly in Karamadai (2 grids), Bolampatty (2) ranges, and single grids each in Sirumugai, Mettupalayam, Madukkarai, and Coimbatore ranges. These grids are dominated by tree cover (65%) and rangeland (22%), followed by minor proportions of cropland and water (5%), and built-up area (3%).

Medium Sighting Grids

Medium raptor sightings were recorded in a total of 17 grids across the study area. These grids are distributed primarily in Madukkarai range (5 grids) and Coimbatore range (5 grids), indicating moderate raptor activity. Sirumugai range had three such grids, Mettupalayam range had two, while Karamadai and Bolampatty ranges each had one grid falling within this category.

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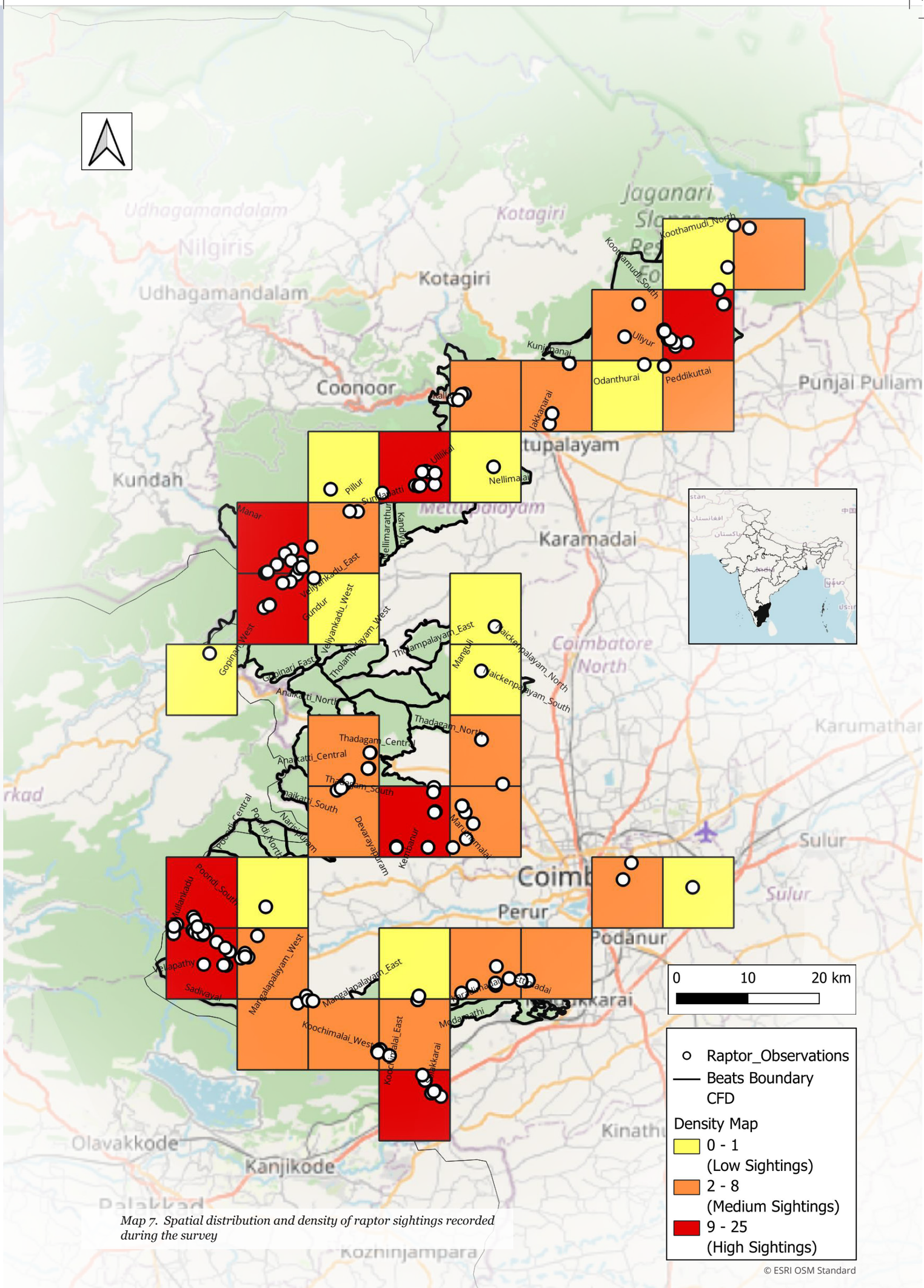
Low Sighting Grids

Low raptor sighting grids, categorised as 0 to 1 sighting per grid, occurred in 11 grids spread over several ranges. Periyanaickenpalayam range had the highest number of grids in this category with three, followed by Sirumugai and Madukkarai ranges with two grids each. Mettupalayam, Karamadai, and Bolampatty ranges contributed to this group with one or two grids each.



Map 7. Spatial distribution and density of raptor sightings recorded during the survey

5.2.5 Habitat Use by Raptors

The raptor survey in Coimbatore Forest Division provided preliminary insights into the habitat preferences among the observed species. Tree-dominated habitats supported the highest species richness, with 21 species accounting for 60% of the total sightings (202). Rangelands followed, with 12 species and 22% of the total sightings. Croplands supported 9 species (12%), while water bodies and urban/built-up areas accounted for 3 species and 3% of the total sightings (Figure 5 & Map 8).

Habitat specialists which prefer specific environments such as osprey (*Pandion haliaetus*) was observed near water bodies, while generalist species which can adapt to a wide range of habitats like the black kite (*Milvus migrans*), Brahminy kite (*Haliastur indus*), and shikra (*Tachyspiza badia*) were also recorded in built-up areas. Notably, tree dominated areas and rangelands together comprised over 80% of 202 raptor sightings, highlighting their critical role in supporting raptor diversity in the project area. These findings underscore the significance of heterogeneous landscapes, particularly tree cover and open rangelands which are also referred as ecotones.

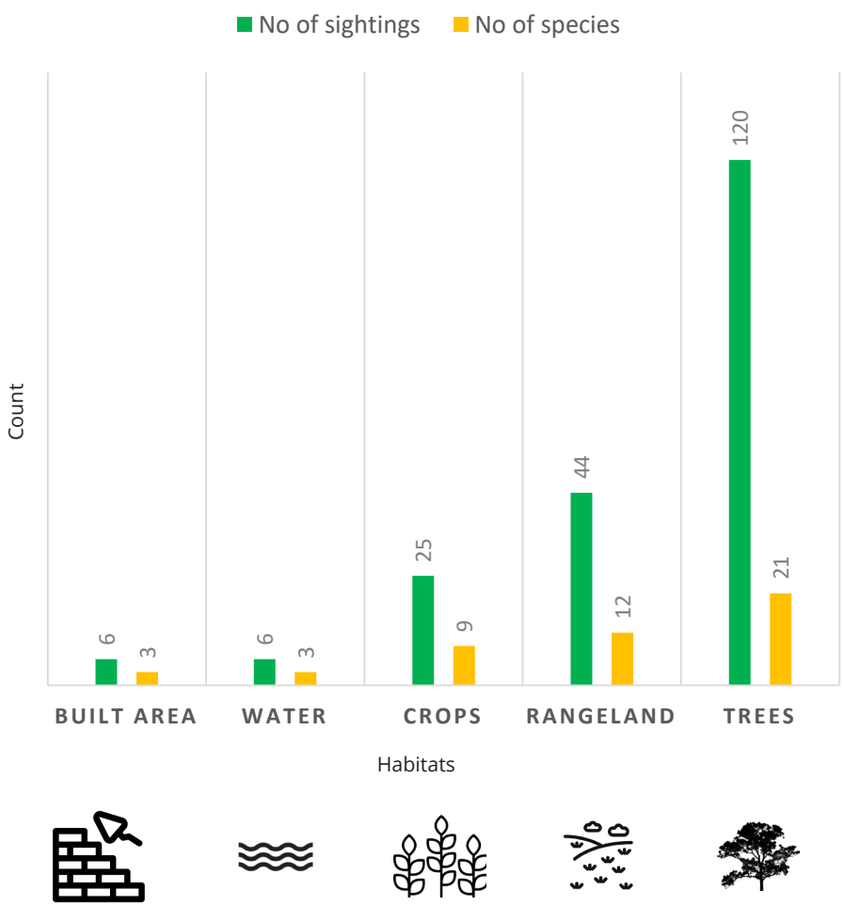
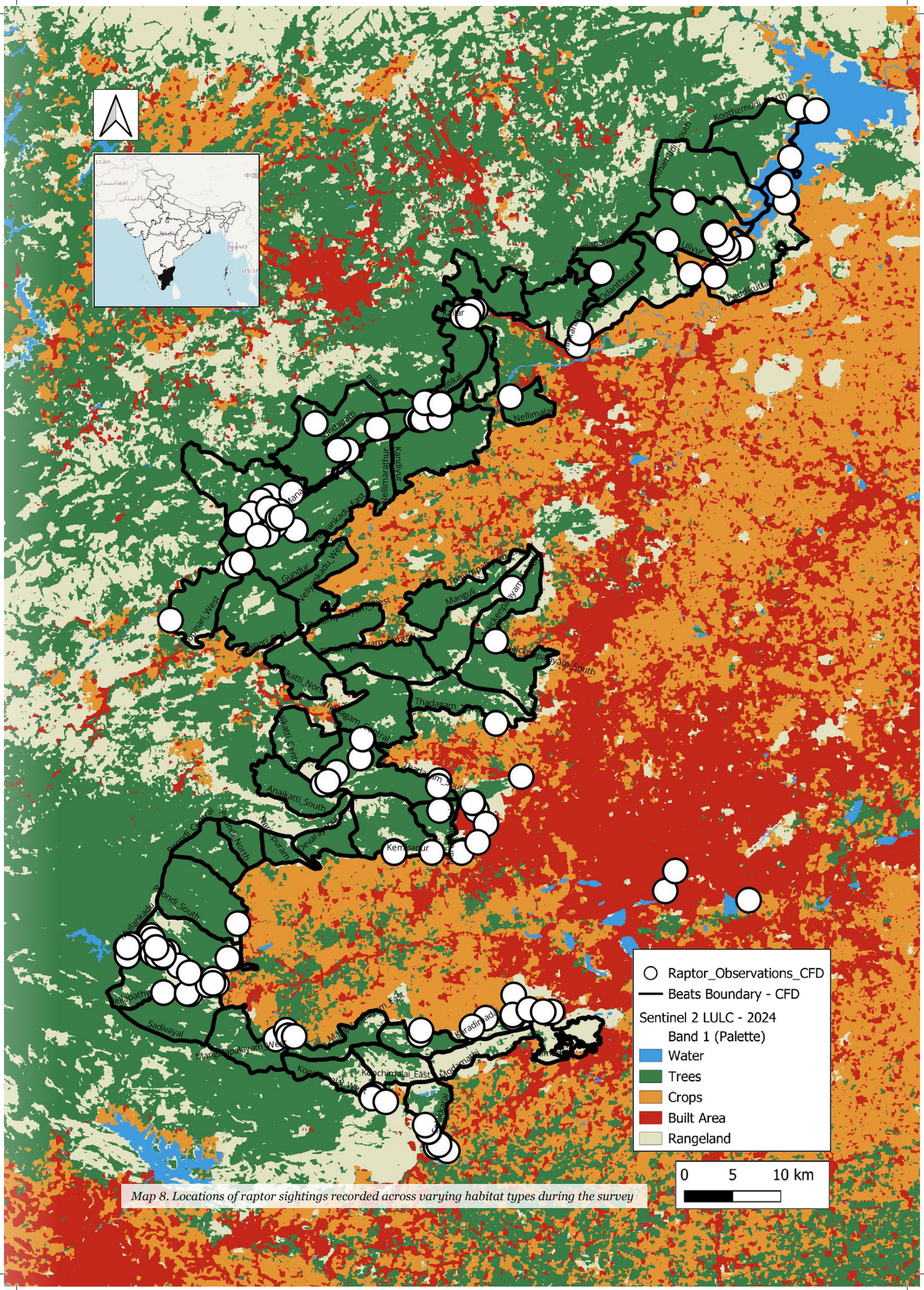


Figure 5. Number of raptor sightings and species recorded in various habitat types during the survey



Map 8. Locations of raptor sightings recorded across varying habitat types during the survey

Habitat Use by Raptors

Habitat type and % of raptor sightings	Description*	No. of species found
Water 3%	Areas where water was predominantly present throughout the year; may not cover areas with sporadic or ephemeral water; contains little to no sparse vegetation, no rock outcrop nor built up features like docks; examples: rivers, ponds, lakes, oceans, flooded salt plains.	03 Brahminy kite, greater spotted-eagle, osprey
Trees 60%	Any significant clustering of tall (~15 feet or higher) dense vegetation, typically with a closed or dense canopy; examples: wooded vegetation, clusters of dense tall vegetation within savannas, plantations, swamp or mangroves (dense/ tall vegetation with ephemeral water or canopy too thick to detect water underneath).	21 Black eagle, Bonelli's eagle, booted eagle, Brahminy kite, brown fish-owl, brown hawk-owl, changeable hawk-eagle, Eurasian kestrel, crested serpent-eagle, greater spotted-eagle, oriental honey-buzzard, Indian eagle-owl, Indian scops-owl, jungle owlet, legge's hawk-eagle, oriental scops-owl, rufous bellied-eagle, shikra, short-toed snake-eagle, spot-bellied eagle-owl, spotted owlet

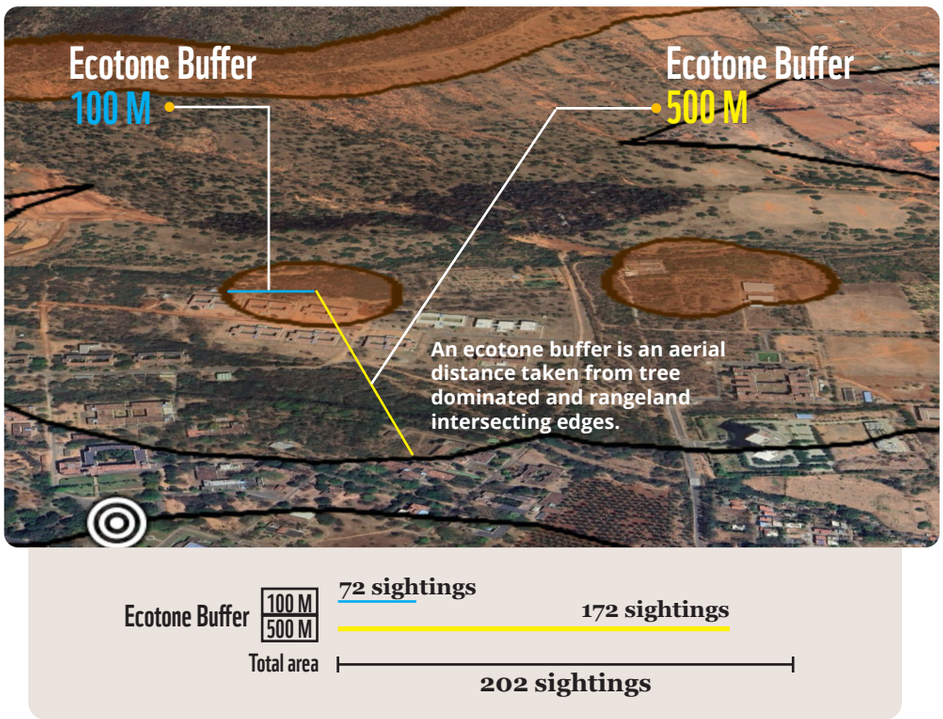
**The class descriptions are from the global map of land use/land cover (LULC) derived from ESA Sentinel-2 imagery at 10m resolution available at - https://www.arcgis.com/home/item.html?id=cfcb7609de5f478eb7666240902d4d3d. Accessed on 20th July 2025.*

Crops 12%	Human planted/plotted cereals, grasses, and crops not at tree height; examples: corn, wheat, soy, fallow plots of structured land.	**09** Black kite, Brahminy kite, crested serpent-eagle, greater spotted-eagle, oriental honey-buzzard, osprey, Indian eagle-owl, shikra, spotted owlet
Built area 3%	Human made structures; major road and rail networks; large homogenous impervious surfaces including parking structures, office buildings and residential housing; examples: houses, dense villages / towns / cities, paved roads, asphalt.	**03** Black kite, Brahminy kite, shikra
Rangeland 22%	Open areas covered in homogenous grasses with little to no taller vegetation; wild cereals and grasses with no obvious human plotting (i.e., not a plotted field); examples: natural meadows and fields with sparse to no tree cover, open savanna with few to no trees, parks/golf courses/lawns, pastures. Mix of small clusters of plants or single plants dispersed on a landscape that shows exposed soil or rock; scrub-filled clearings within dense forests that are clearly not taller than trees; examples: moderate to sparse cover of bushes, shrubs and tufts of grass, savannas with very sparse grasses, trees or other plants.	**12** Black eagle, black-winged kite, booted eagle, Brahminy kite, changeable hawk-eagle, crested serpent-eagle, Eurasian kestrel, oriental honey-buzzard, shikra, short-toed snake-eagle, spotted owlet, white-eyed buzzard

5.2.6 Ecotones Preferences by Raptors

To assess the ecotone-use patterns, raptor sightings were spatially overlaid with ecotone buffer zones (100 m and 500 m). A chi-squared goodness-of-fit test was conducted to determine whether raptors appeared in ecotone zones more often than expected based on the size of these areas in the landscape.

172 sightings out of 202 were observed within the 500 m buffer and 72 within the 100 m buffer zone (Map 9). Statistical analysis indicated a highly significant association for the 500 m buffer ($\chi 2 = 17.481$, df = 1, $p < 0.001$) which was even stronger for the 100 m buffer, with a chi-square value of $\chi 2 = 32.815$ (df = 1, $p < 0.001$), indicating a strong preference for immediate edge habitats likely reflecting the greater availability of resources and diverse microhabitats found in ecotone areas, offering raptors optimal conditions for perching, hunting, and nesting (Figure 6).



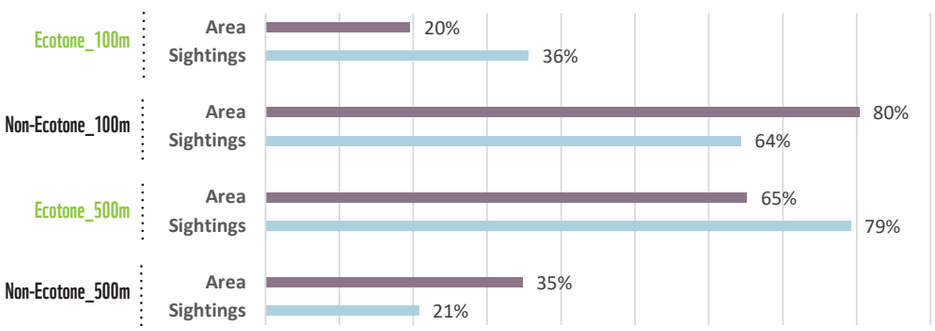
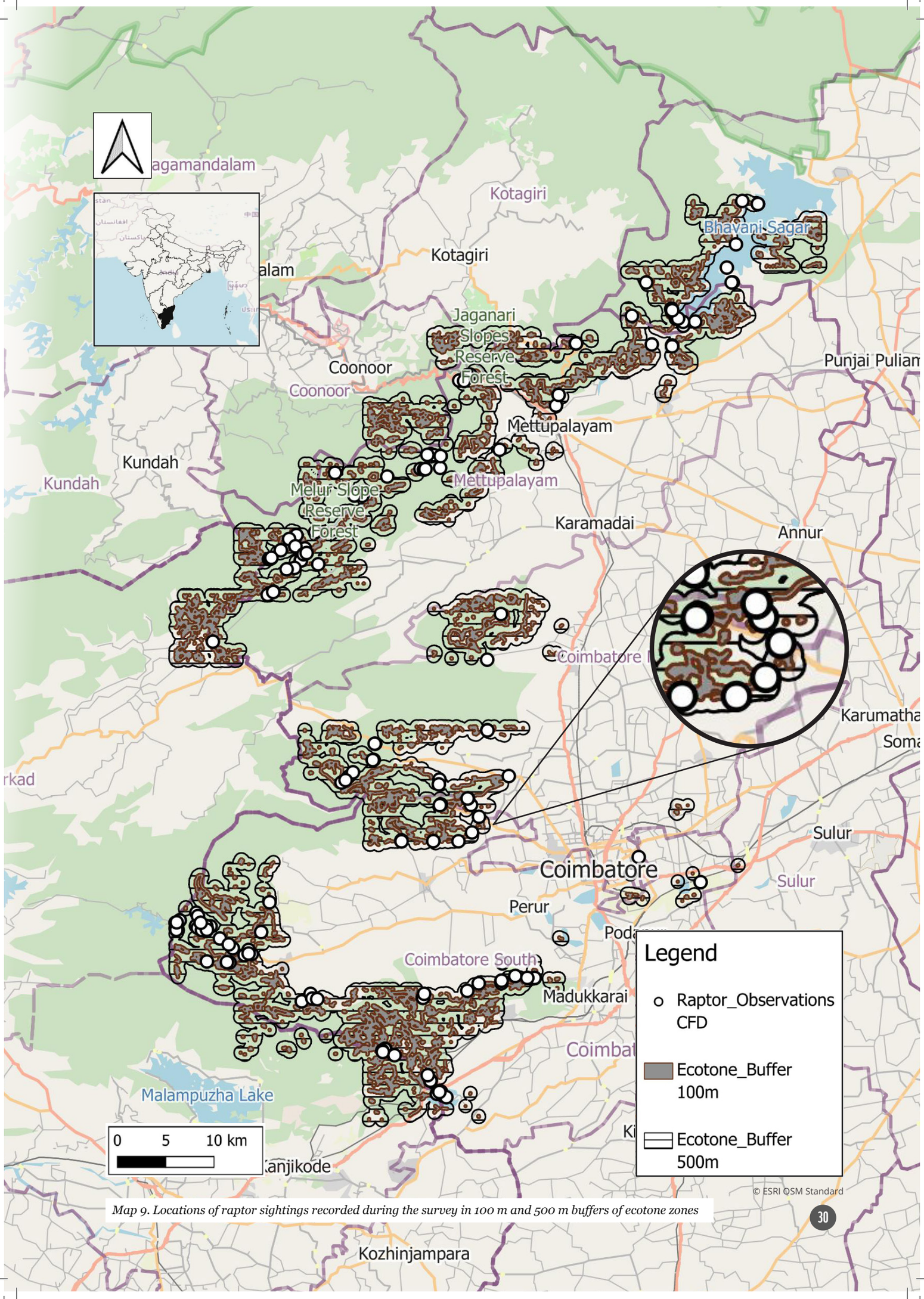


Figure 6. Proportion of raptor sightings recorded during the survey, in relation with the area under ecotone and non-ecotone zones

Raptor sightings are higher in ecotone zones despite their smaller area compared to non-ecotone zones. 100 m buffer of ecotones comprise only 20% of the area but account for 36% of the total raptor sightings, while within the 500 m buffer, they cover 65% of the area and represent 79% of the total raptor sightings, demonstrating a strong preference for ecotone habitats.

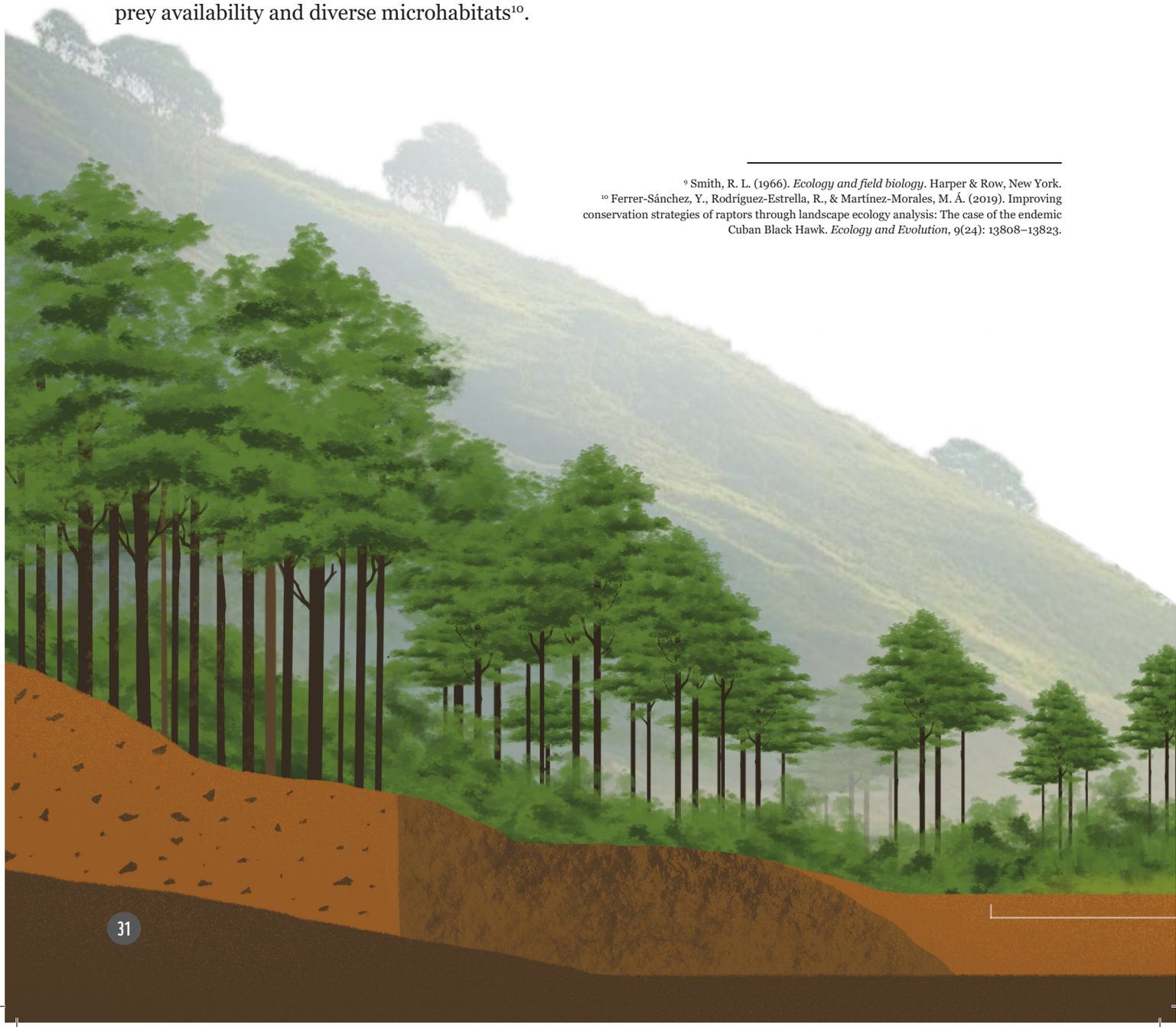


Map 9. Locations of raptor sightings recorded during the survey in 100 m and 500 m buffers of ecotone zones

6. INFERENCE

6.1 Ecological Importance of Ecotones for Raptors

Edges are among the most conspicuous features of the landscape. The boundaries where the blocks of vegetation meet are called edges. These boundaries are not only ecologically significant but also influence species distributions and landscape dynamics. The vegetation of one patch blends with the other to form a transition zone called an ecotone. Ecotones can be of different types which can be categorised based on the features (width, origin, shape), temporal stability (directional, shifting, stationary), and by their location (terrestrial, aquatic or riparian). In an ecotone, species common to each type of vegetation share the resources with species common to the edge. The greater the contrast between adjoining communities, the greater species richness should be[9]. Studies have shown that raptors frequently utilise ecotones for feeding, breeding, and nesting, benefiting from both increased prey availability and diverse microhabitats[10].



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Ecotones offer a unique combination of resources: the structural complexity of trees provides nesting and roosting sites, while adjacent open areas such as rangelands and croplands supply abundant foraging opportunities. Studies show that raptors often select nesting and foraging sites based on landscape-level features, including the proximity and configuration of different habitat types, which can influence productivity and persistence[11].

In this study, raptor sightings were higher in ecotone zones despite their smaller area compared to non-ecotone zones in the landscape. Although ecotones constitute only a small fraction of the area, they accounted for a substantial share of raptor observations. Analysis of eBird data showed that 78.6% of 5,086 sightings occurred in ecotone zones, well above the expected count based on their proportional area. The analysis of field survey data further confirmed that this pattern: the 100-meter ecotone buffer, which covers merely 20% of the study area, supported 40% of raptor sightings, while the 500-meter ecotone buffer, encompassing about 70% of the area, accounted for over 80% of the sightings. Statistical tests confirmed these associations. The strong preference for ecotone areas demonstrated in both eBird analysis (78.6% of 5086 sightings in ecotone zones) and field surveys ($\chi 2 = 32.815$, $p < 0.001$ for 100m buffer) provides compelling evidence for the edge effect hypothesis, which suggests that ecotones enhance resource availability due to the combination of habitats and increased prey diversity. The consistent preference for ecotones across datasets underscores their ecological importance in sustaining raptor populations.

The persistence of ecotones in the project area are under increasing pressure. Protecting and restoring these habitat mosaics is crucial for the long-term conservation of raptors, as their high concentration in ecotones underscores the importance of maintaining habitat diversity and preventing further landscape fragmentation. It is therefore critical to assess how planned expansion will affect areas preferred by raptors, especially ecotones, so that conservation priorities can be integrated into development planning.

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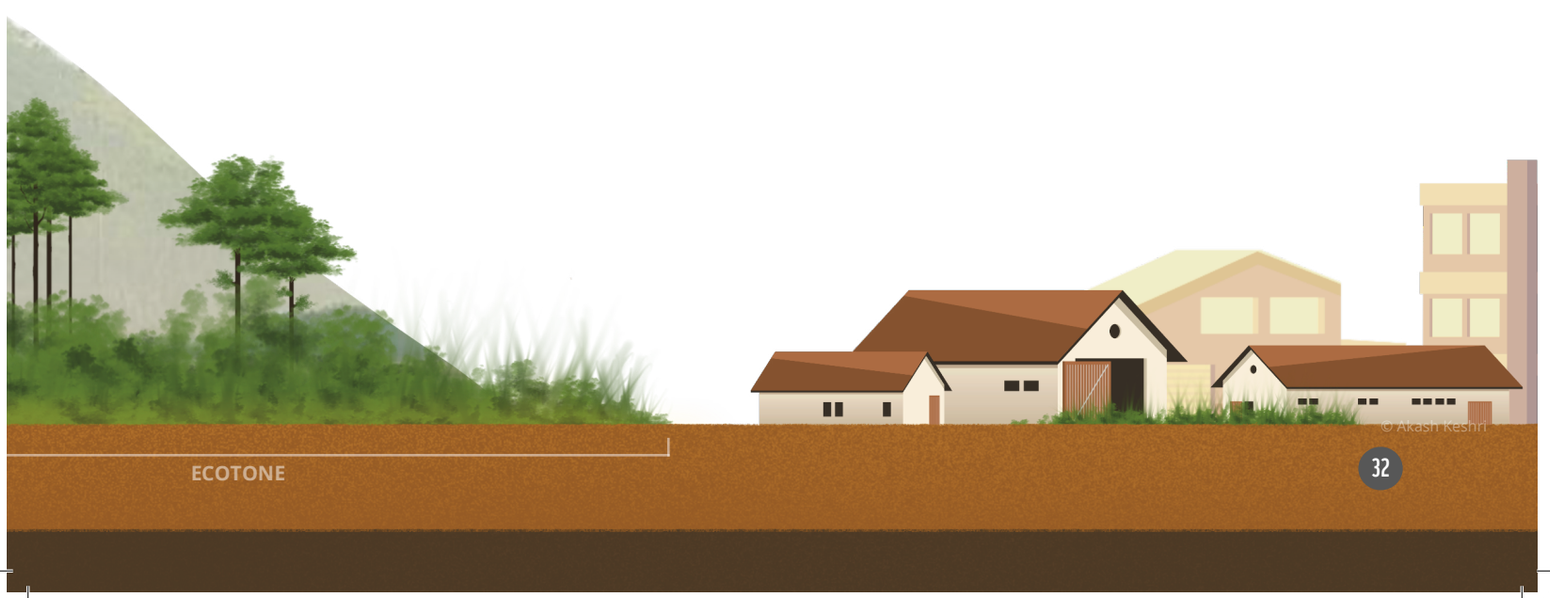

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6.1.1 Urbanisation and Raptors

Located at the foothills of the Western Ghats, Coimbatore occupies a unique ecological interface between mountain forests and human-modified landscapes. The city and its surrounding regions support over 30 species of raptors (source: eBird and various regional checklists), including apex avian predators such as the Legge's hawk-eagle (*Nisaetus kelaarti*), black baza (*Aviceda leuphotes*), Sri Lanka bay-owl *(Phodilus assimilis*), amur falcon (*Falco amurensis*), peregrine falcon (*Falco peregrinus*). Studies from 2005, 2018 & 2024 have shown presence of Indian spotted-eagle (*Clanga hastata*), common kestrel (*Falco tinnunculus*), Western marsh harrier (*Circus aeruginosus*), spotted owlet (*Athene brama*), booted eagle (*Hieraaetus pennatus*) and greater spotted-eagle (*Clanga clanga*) in the urban areas[12,13,14]. These species depend on a mosaic of habitats such as wetlands, open grasslands, agricultural fringes, urban woodlots, and sacred groves, many of which overlap with zones earmarked for development in the Coimbatore Master Plan 2041.

Coimbatore's built-up area increased by approximately 114% between 2000 and 2020[15]. The city of Coimbatore has expanded substantially from 38 sq. km in 1973 to 79 sq. km in 1989, and further increased more than fivefold to 274 sq. km by 2010[16] (Map 10). This rapid urbanisation, while a driver of economic growth, has fragmented ecologically sensitive zones, particularly in the city's peri-urban fringes (Map 11 and Map 12). Without ecological safeguards, development of planned infrastructure such as highways, transmission lines, and industrial corridors will accelerate the loss of ecotones, wooded patches, and fallow fields critical for raptor foraging and nesting. These trends mirror global findings that identifies urbanisation as a key driver of habitat loss, biodiversity decline, and ecological homogenisation[17,18].

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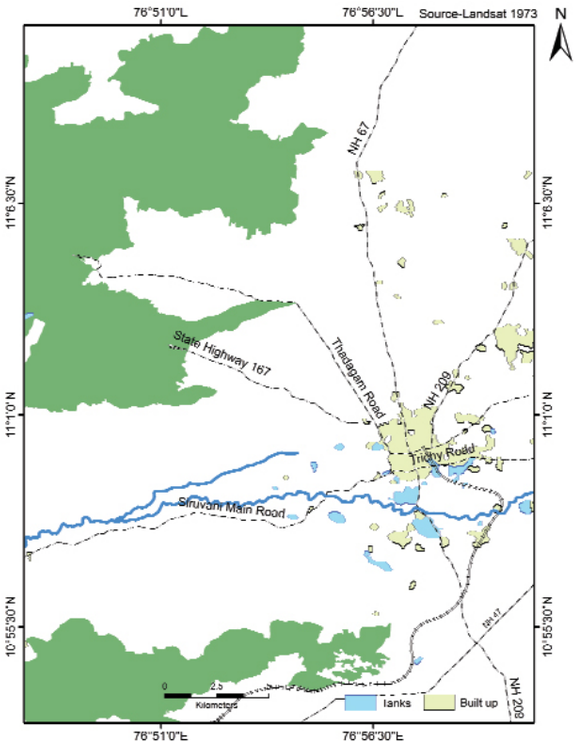
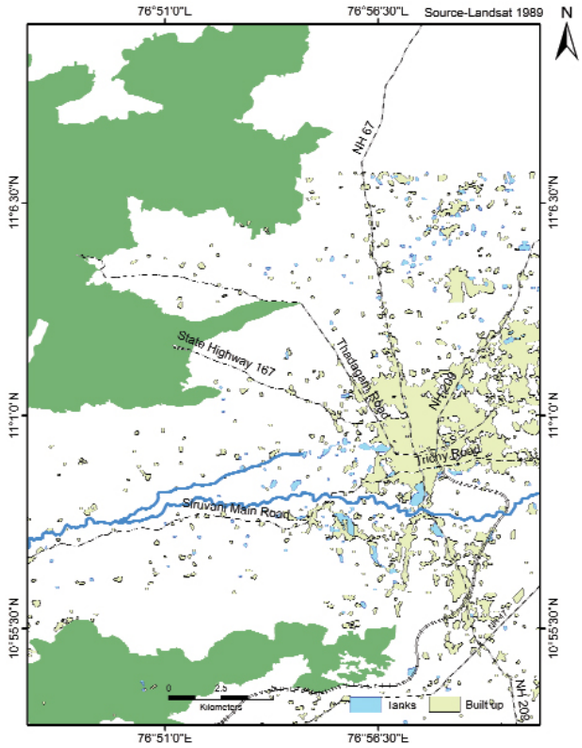
Urban Expansion in Coimbatore 1973-2010

1973



1989



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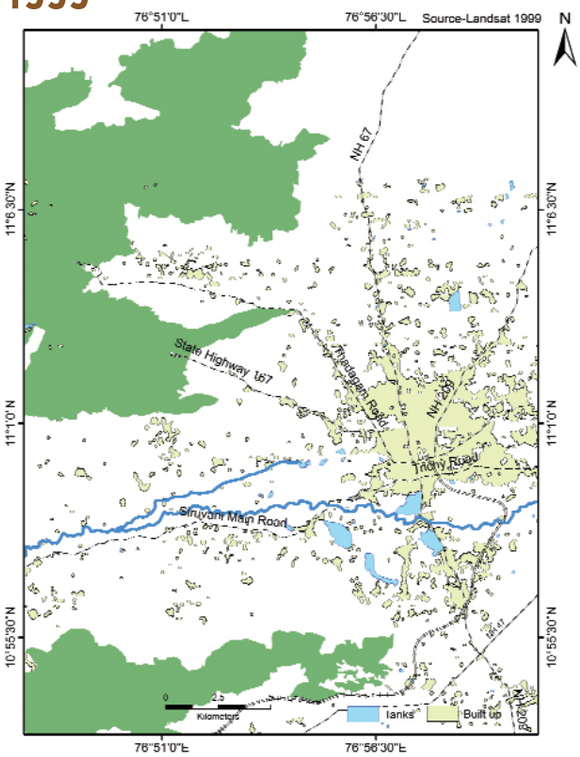

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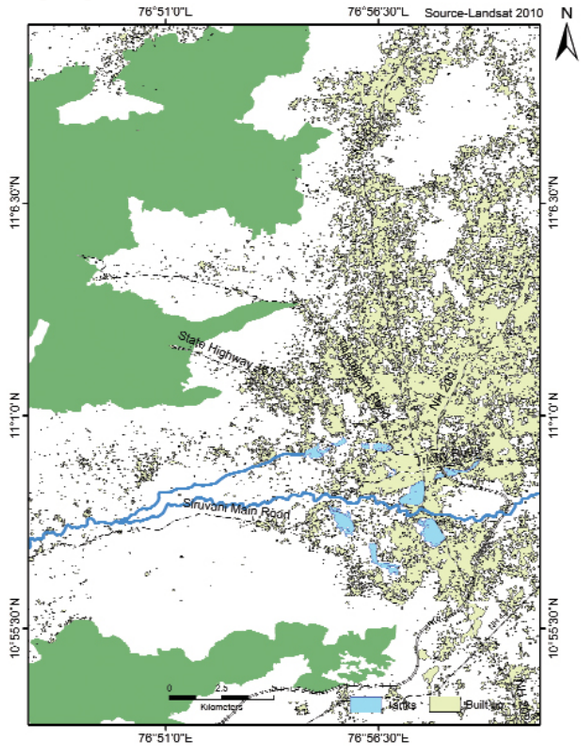
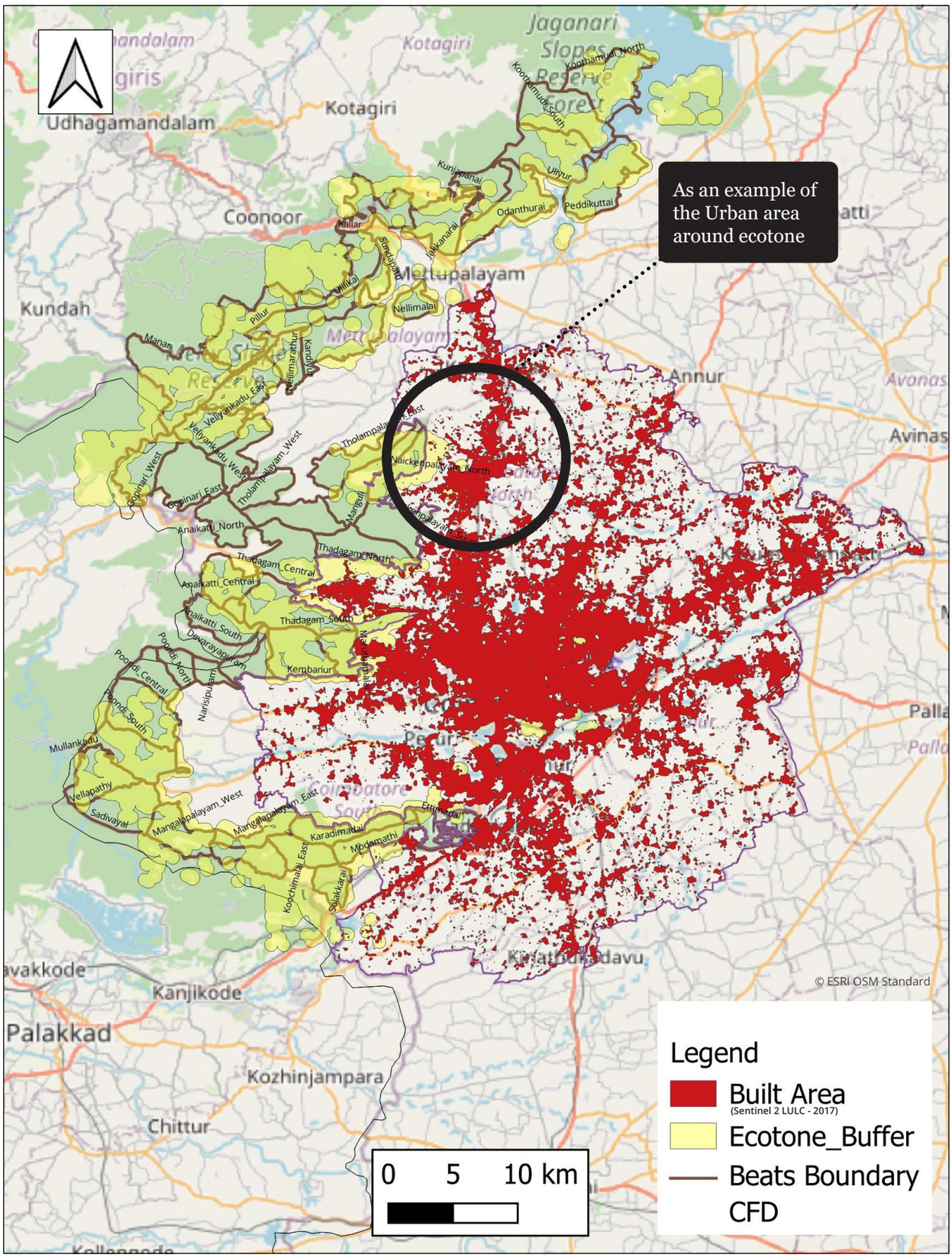


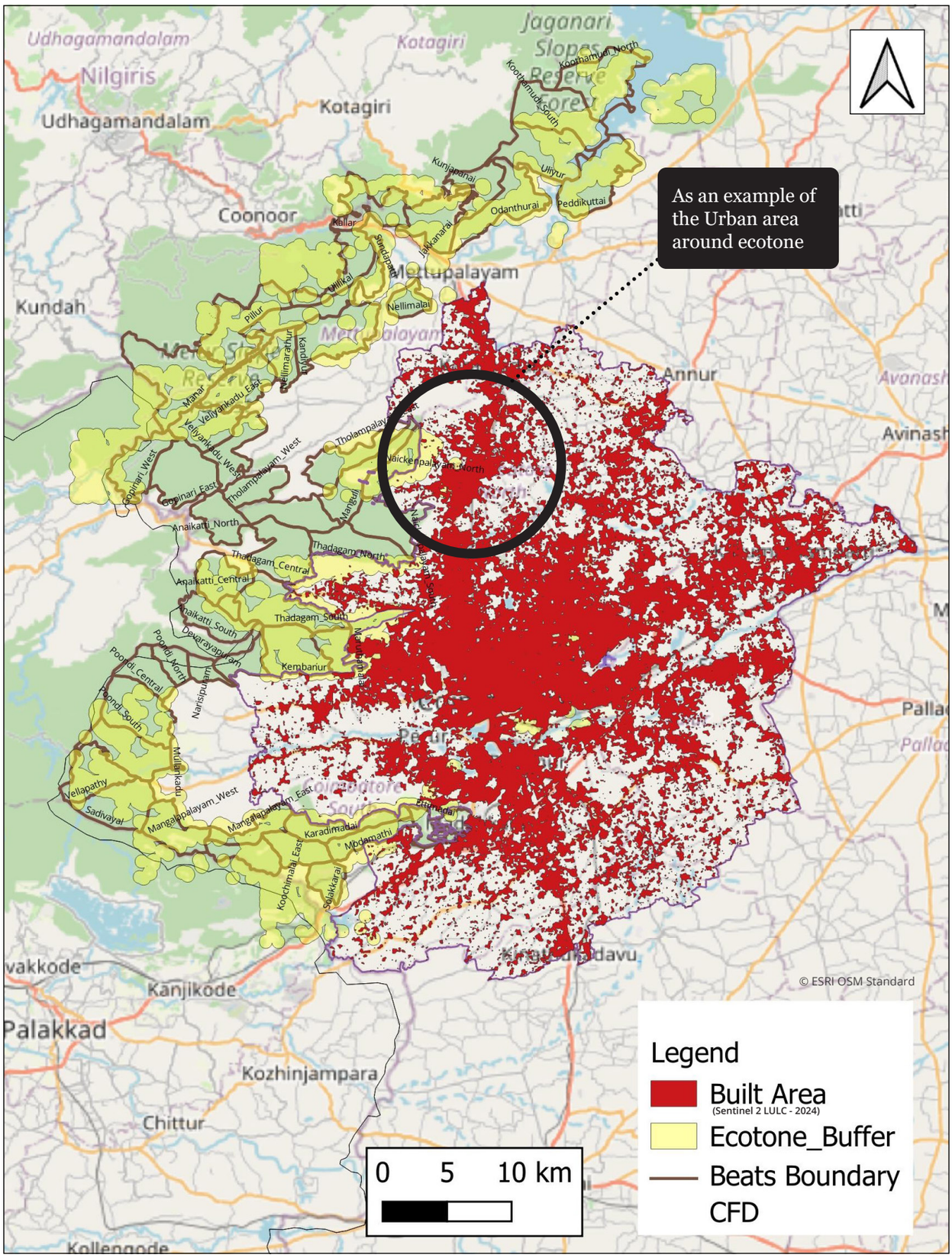
Map 10. Urban growth of Coimbatore city from 1973 to 2010

Urban Expansion in Coimbatore 2017



Map 11. Built area in 2017 in Coimbatore city

Urban Expansion in Coimbatore 2024



Map 12. Built area in 2024 in Coimbatore city

6.2 Conservation risks

Coimbatore is on the cusp of major transformation under the upcoming Master Plan 2041, which outlines ambitious goals for spatial expansion, industrial development, improved connectivity, and economic diversification (Map 13). With the city's population projected to rise from approximately 2.7 million (2021) to over 4.5 million by 2041, urban planning must proactively address the imperatives of ecological sustainability alongside development.

One key aspect of this is the conservation of urban and peri-urban raptor species, which function as indicators of environmental health and providers of essential ecosystem services.

Urban expansion presents multiple direct threats to raptor populations, including:

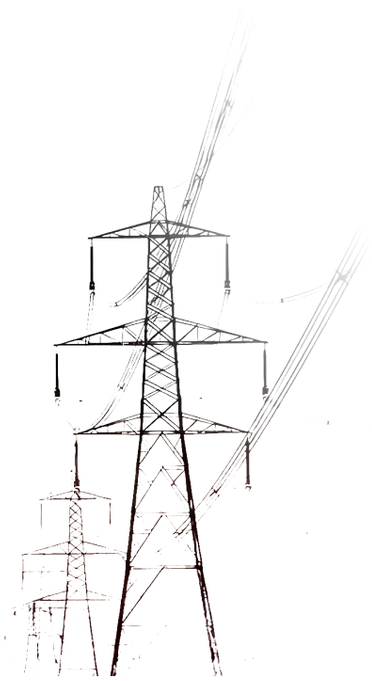
- Collisions with built structures, especially glass facades and high-rise buildings.
- Electrocution from exposed or poorly insulated power infrastructure.
- Light pollution disrupts the hunting and navigation of nocturnal raptors.
- Exposure to environmental toxins such as rodenticides and pesticides.
- Intentional persecution arising from conflict or superstition.

If ecological considerations are not embedded into urban design, these pressures can significantly undermine raptor survival and reproduction.

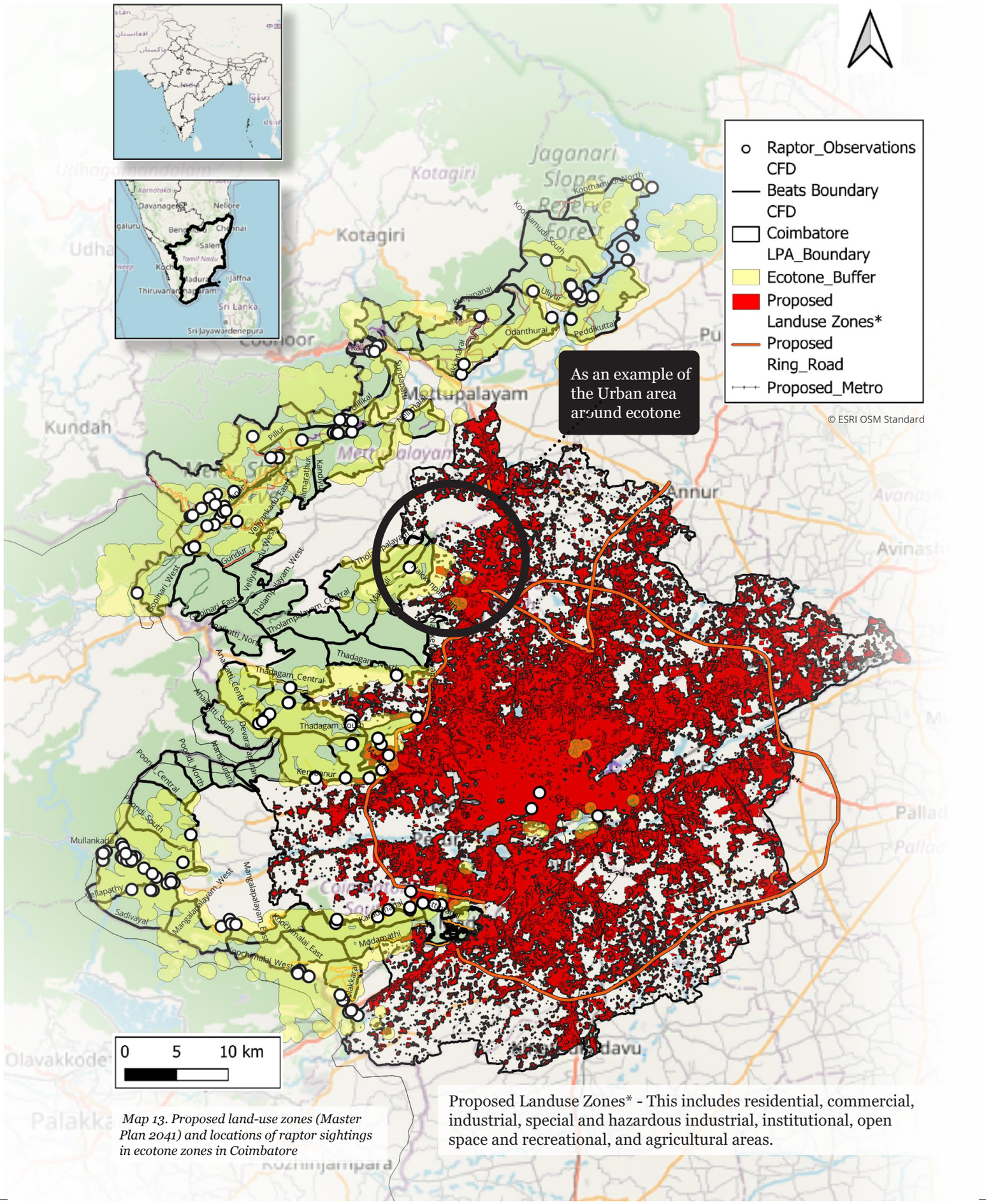
Raptors play a vital role in maintaining urban ecological resilience. By regulating populations of rodents, pigeons, and other commensal species, they reduce the need for chemical pest control. Their decline can lead to an overuse of rodenticides, contributing to secondary poisoning of other wildlife and pets, and resulting in accumulations of waste that further attract free-ranging dogs. An increase in free-ranging dog populations in areas with unmanaged organic waste is also associated with lower scavenger populations, posing additional public health and safety concerns.

Raptors also function as bio-indicators, with their decline often signalling wider ecosystem stress across trophic levels. Integrating raptor conservation into the fabric of Coimbatore's urban planning would not only stabilise ecosystems but also deliver cost-effective, nature-based solutions for urban environmental management. This approach would align ecological well-being with public health, governance, and sustainable development goals.

Looking ahead, Coimbatore's unique position within the Western Ghats and its rapid urbanisation calls for a forward-thinking strategy. By treating raptors as keystone species and integrating conservation into the Master Plan 2041, the city can enhance urban resilience, foster inclusive and nature-positive development, and position itself as a model for balancing growth with long-term ecological integrity.



Anticipated Urban Expansion as per Coimbatore Master Plan - 2041



Map 13. Proposed land-use zones (Master Plan 2041) and locations of raptor sightings in ecotone zones in Coimbatore

Proposed Landuse Zones* - This includes residential, commercial, industrial, special and hazardous industrial, institutional, open space and recreational, and agricultural areas.

7. WAY FORWARD

This first-of-its-kind raptor survey in the Coimbatore Forest Division highlights the ecological importance of diverse landscapes, especially ecotones, in sustaining raptor populations. As the city undergoes rapid expansion and transformation, it is a natural imperative that raptor conservation is integrated into the planning, building, and governance of urban and peri-urban areas. Elevating raptors as a focal consideration in city planning will strengthen biodiversity outcomes and urban resilience. The following actions can provide a framework for embedding raptor conservation into Coimbatore's development trajectory.

Protect Critical Habitats through Urban Land-Use Planning

Preventing further habitat fragmentation requires the identification, mapping, and integration of key raptor habitats, including wetlands, ecotones, wooded patches, and open scrublands, into Coimbatore's zoning and land-use regulations. Embedding these habitats within the spatial framework of the Coimbatore Master Plan 2041 will help safeguard ecological corridors and preserve essential breeding and foraging areas. Without such mitigation, linear infrastructure and rapid spatial expansion risk replicating global urbanisation patterns, resulting in fragmented habitats, ecological homogenisation, and biodiversity loss.

Restore and Secure Urban Greenbelts and Peri-Urban Buffers

Reviving degraded green spaces, wetlands, and peri-urban buffer zones is essential for sustaining raptor food webs and movement corridors. These landscapes should be mapped and formally recognized as ecological infrastructure in the city's master planning process. Nature-based Solutions—such as native afforestation, wetland restoration, and green corridor development—can build climate resilience while conserving urban biodiversity.

Use Smart City Technologies for Raptor Monitoring

Leveraging Coimbatore's Smart City infrastructure, a real-time ecological monitoring system should be developed to track raptor populations, habitat use, and emerging threats. Integrating citizen science, remote sensing, and urban GIS platforms can enable timely and responsive urban planning decisions. This will also enhance the ecological intelligence and transparency of the Smart City governance framework.

Promote Bird-Safe Infrastructure Standards

Urban infrastructure should be designed or retrofitted to minimise risks of electrocution and collisions for raptors. Measures include insulating exposed power lines, installing bird diverters, using non-reflective architectural glass, and incorporating nest boxes on public and institutional rooftops. Including bird-safe standards in municipal building codes and infrastructure guidelines can reduce direct mortality and enhance breeding success, particularly for urban-adapted species.

Reform Waste and Pest Control Practices for Ecological Safety

The use of toxic rodenticides and inadequate carcass disposal practices increases the risk of secondary poisoning, especially for scavenging raptors such as kites and vultures. Reforming these practices—particularly near ecotones and waste accumulation zones—is essential. Promoting ecological pest control and strengthening urban waste management systems will reduce human-wildlife conflict and reinforce the natural pest regulation services provided by raptors. Additionally, the decline of scavengers has been associated with a rise in free-ranging dog populations, which pose added public health and safety risks.

Establish Urban Biodiversity Governance Mechanisms

To ensure cross-sector coordination, a dedicated Urban Biodiversity Cell should be established within the Smart City Special Purpose Vehicle (SPV) or under the Coimbatore Municipal Corporation. This cell can serve as a central institutional mechanism for aligning biodiversity conservation with climate resilience, infrastructure development, and public health policies. Institutionalising such governance is key to mainstreaming biodiversity into the city's development agenda and fulfilling commitments under India's National Biodiversity Action Plan.

Engage Citizens and Educate Future Generations

Long-term conservation success depends on public engagement and ecological literacy. Initiatives like "*Raptors in My City*", guided nature walks, and storytelling campaigns can foster awareness and appreciation of urban wildlife. Embedding raptor-related themes in school and college curricula will help cultivate an informed citizenry. Promoting community-based conservation not only builds local ownership but also aligns with India's participatory governance ethos.

Action Plan

Elevating Raptors in Coimbatore's Urban Planning

This action plan outlines a strategic framework for elevating raptor conservation within Coimbatore's urban and peri-urban development agenda. It identifies priority interventions across habitat protection, infrastructure planning, urban design, ecological monitoring, and community engagement. The plan calls for coordinated action among relevant stakeholders and recommends the integration of raptor conservation strategies into city-level planning processes, ensuring effective implementation and long-term sustainability.

Habitat Identification & Protection

- Map urban and peri-urban raptor habitats
- Identify ecological corridors and roosting zones

Forest Dept., Civil Society, Coimbatore Urban Development Authority, Urban Planning Dept.

Master Plan 2041, Tamil Nadu Biodiversity Strategy, City Biodiversity Index

Urban Design for Raptors

- Create green corridors, native tree groves
- Protect ecotones and open lands within city expansion areas

Horticulture Dept., Urban Local Bodies (ULBs), Ecologists

Master Plan 2041, National Clean Air Programme, National Biodiversity Strategy and Action Plan

Bird-safe Infrastructure

- Retrofit high-risk powerlines with insulation & diverters
- Promote non-reflective glass, nest boxes on rooftops

Tamil Nadu Generation and Distribution Corporation Limited, Smart City Special Purpose Vehicle (SPV), Public Works Dept.

Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation 2.0, Urban Greening Guidelines

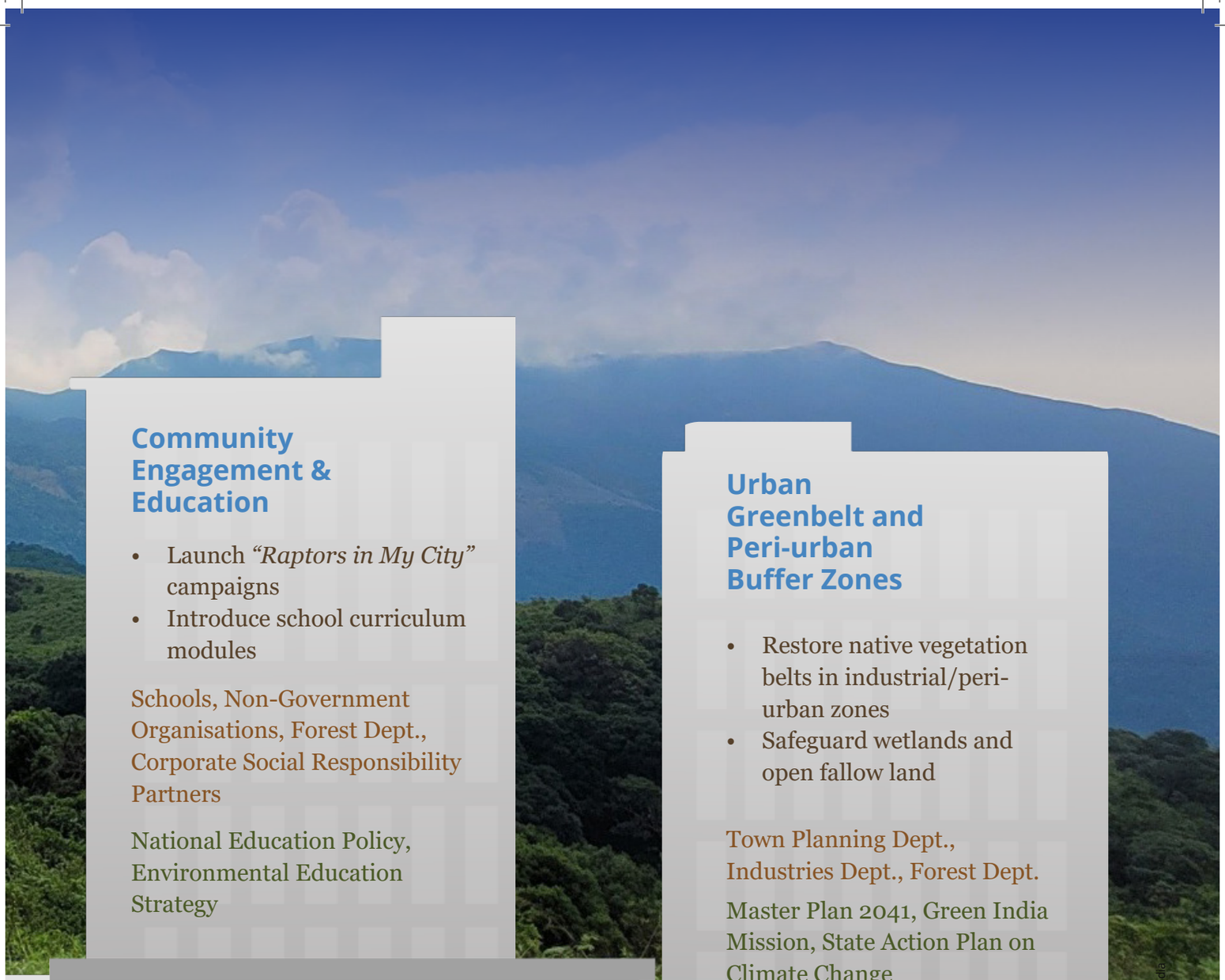
Waste & Pest Management Integration

- Regulate rodenticide use in vulnerable zones
- Improve slaughterhouse and carcass disposal systems

Coimbatore Corporation, Sanitation Dept., Animal Husbandry Dept.

Swachh Bharat Mission, Urban Solid Waste Rules, Public Health Guidelines

Action Area	Key Actions	Lead Stakeholders	Relevant Plans/Policies



Community Engagement & Education

- Launch *"Raptors in My City"* campaigns
- Introduce school curriculum modules

Schools, Non-Government Organisations, Forest Dept., Corporate Social Responsibility Partners

National Education Policy, Environmental Education Strategy

Urban Greenbelt and Peri-urban Buffer Zones

- Restore native vegetation belts in industrial/peri-urban zones
- Safeguard wetlands and open fallow land

Town Planning Dept., Industries Dept., Forest Dept.

Master Plan 2041, Green India Mission, State Action Plan on Climate Change

Monitoring & Digital Systems

- Develop a raptor monitoring dashboard
- Integrate sightings data into city Geographic Information System

Civil Society, Information Technology Dept., Citizen Science Groups

Smart City Information and Communication Technology platform, Urban Biodiversity Index

Policy & Institutional Coordination

- Set up Urban Biodiversity Cell within Smart City SPV
- Align biodiversity, planning, and power agencies

Smart City SPV, Coimbatore Municipal Corporation, Tamil Nadu Forest Dept.

Local Biodiversity Strategy and Action Plan, Smart City Governance Framework

Action Area	Key Actions	Lead Stakeholders	Relevant Plans/Policies

8. ANNEXURES

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Annexure 1: Raptor Species Diversity and Status

Sl. No.	Common Name	Scientific Name	IUCN Status*	SoIB Trend**
Order: Accipitriformes l Family: Accipitridae				
1	Black eagle	*Ictinaetus malayensis*	NT	S
2	Bonelli's eagle	*Aquila fasciata*	LC	S
3	Booted eagle	*Hieraaetus pennatus*	LC	S
4	Changeable hawk-eagle	*Nisaetus cirrhatus*	LC	S
5	Legge's hawk-eagle	*Nisaetus kelaarti*	NK	ID
6	Crested serpent-eagle	*Spilornis cheela*	LC	TI
7	Greater spotted-eagle	*Clanga clanga*	VU	S
8	Rufous-bellied eagle	*Lophotriorchis kienerii*	NT	TI
9	Short-toed snake-eagle	*Circaetus gallicus*	LC	RD
10	Black kite	*Milvus migrans*	LC	S
11	Black-winged kite	*Elanus caeruleus*	LC	D
12	Brahminy kite	*Haliastur indus*	LC	S
13	Oriental honey-buzzard (Crested honey-buzzard)	*Pernis ptilorhynchus*	LC	S
14	White-eyed buzzard	*Butastur teesa*	LC	TI
15	Shikra	*Tachyspiza badia*	LC	TI
Order: Accipitriformes l Family: Pandionidae				
16	Osprey	*Pandion haliaetus*	LC	RD
Order: Falconiformes l Family: Falconidae				
17	Eurasian kestrel (Common Kestrel)	*Falco tinnunculus*	LC	RD
Order: Strigiformes l Family: Strigidae				
18	Brown fish-owl	*Ketupa zeylonensis*	LC	D
19	Spot-bellied eagle-owl	*Ketupa nipalensis*	LC	NK
20	Rock eagle-owl (Indian eagle-owl)	*Bubo bengalensis*	LC	NK
21	Indian scops-owl	*Otus bakkamoena*	LC	NK
22	Oriental scops-owl	*Otus sunia*	LC	NK
23	Brown hawk-owl	*Ninox scutulata*	LC	NK
24	Jungle owlet	*Glaucidium radiatum*	LC	I
25	Spotted owlet	*Athene brama*	LC	NK

*Abbreviations: NT: Near Threatened, LC: Least Concern; NK: Not Known
**S: Stable, ID: Insufficient Data, NK: Not Known, I: Increase, RD: Rapid Decline, D: Decline, TI: Trend inconclusive

Annexure 2: Species Diversity Across Survey Ranges

Sl No.	Species name	Scientific Name	Bolampatty	Coimbatore
1	Black eagle	*Ictinaetus malayensis*	✓	-
2	Bonelli's eagle	*Aquila fasciata*	✓	✓
3	Booted eagle	*Hieraaetus pennatus*	✓	✓
4	Changeable hawk-eagle	*Nisaetus cirrhatus*	✓	-
5	Legge's hawk-eagle	*Nisaetus kelaarti*	✓	-
6	Crested serpent-eagle	*Spilornis cheela*	✓	✓
7	Greater spotted-eagle	*Clanga clanga*	-	-
8	Rufous-bellied eagle	*Lophotriorchis kienerii*	✓	-
9	Short-toed snake-eagle	*Circaetus gallicus*	-	-
10	Black kite	*Milvus migrans*	-	-
11	Black-winged kite	*Elanus caeruleus*	-	✓
12	Brahminy kite	*Haliastur indus*	✓	✓
13	Oriental honey-buzzard	*Pernis ptilorhynchus*	✓	✓
14	White-eyed buzzard	*Butastur teesa*	-	-
15	Shikra	*Tachyspiza badia*	✓	✓
16	Osprey	*Pandion haliaetus*	-	-
17	Eurasian kestrel	*Falco tinnunculus*	✓	✓
18	Brown fish-owl	*Ketupa zeylonensis*	-	✓
29	Spot-bellied eagle-owl	*Ketupa nipalensis*	-	-
20	Rock eagle-owl	*Bubo bengalensis*	-	✓
21	Indian scops-owl	*Otus bakkamoena*	✓	✓
22	Oriental scops-owl	*Otus sunia*	✓	-
23	Brown hawk-owl	*Ninox scutulata*	✓	-
24	Jungle owlet	*Glaucidium radiatum*	-	-
25	Spotted owlet	*Athene brama*	✓	✓

Karamadai	Madukkarai	Mettupalayam	Periyanaickenpalayam	Sirumugai
-	✓	✓	-	✓
-	-	✓	-	-
-	✓	✓	-	-
✓	✓	✓	✓	-
-	-	✓	-	-
✓	✓	✓	✓	-
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-	✓	-	-	-

Annexure 3: eBird Raptors List

Sl No.	Common Name	Scientific Name	IUCN Status	SoIB Status
1	Bonelli's eagle	*Aquila fasciata*	NT	S
2	Short-toed snake-eagle	*Circaetus gallicus*	LC	RD
3	Greater spotted-eagle	*Clanga clanga*	VU	S
4	Indian spotted-eagle	*Clanga hastata*	VU	TI
5	Booted eagle	*Hieraaetus pennatus*	LC	S
6	Lesser fish-eagle	*Icthyophaga humilis*	NT	S
7	Grey-headed fish-eagle	*Icthyophaga ichthyaetus*	NT	ID
8	Black eagle	*Ictinaetus malaiensis*	LC	D
9	Rufous-bellied eagle	*Lophotriorchis kienerii*	NT	TI
10	Changeable hawk-eagle	*Nisaetus cirrhatus*	LC	D
11	Legge's hawk-eagle	*Nisaetus kelaarti*	NT	ID
12	Crested serpent-eagle	*Spilornis cheela*	LC	TI
13	Oriental honey-buzzard	*Pernis ptilorhynchus*	LC	S
14	Osprey	*Pandion haliaetus*	LC	RD
15	Crested goshawk	*Lophospiza trivirgata*	LC	D
16	Shikra	*Tachyspiza badius*	LC	TI
17	Besra	*Tachyspiza virgata*	LC	ID
18	White-rumped vulture	*Gyps bengalensis*	CR	RD
19	Long-billed vulture	*Gyps indicus*	CR	RD
20	White-eyed buzzard	*Butastur teesa*	LC	TI

*Abbreviations: Cr: Critically Endangered, EN: Endangered, NT: Near Threatened, Vu: Vulnerable, LC: Least Concern;
**S: Stable, ID: Insufficient Data, NK: Not Known, I: Increase, RD: Rapid Decline, D: Decline, TI: Trend inconclusive

Sl No.	Common Name	Scientific Name	IUCN Status	SoIB Status
21	Common buzzard	*Buteo buteo*	LC	D
22	Black baza	*Aviceda leuphotes*	LC	TI
23	Marsh harrier	*Circus aeruginosus*	LC	RD
24	Pallid harrier	*Circus macrourus*	LC	RD
25	Montagu's harrier	*Circus pygargus*	LC	RD
26	Red-headed falcon	*Falco chicquera*	LC	D
27	Peregrine falcon	*Falco peregrinus*	LC	D
28	Lesser kestrel	*Falco naumanni*	LC	NK
29	Eurasian kestrel	*Falco tinnunculus*	LC	RD
30	Eurasian sparrowhawk	*Accipiter nisus*	LC	D
31	Black-winged kite	*Elanus caeruleus*	LC	D
32	Brahminy kite	*Haliastur indus*	LC	S
33	Black kite	*Milvus migrans*	LC	S
34	Spotted owlet	*Athene brama*	LC	NK
35	Brown wood-owl	*Strix leptogrammica*	LC	NK
36	Mottled wood-owl	*Strix ocellata*	LC	NK
37	Jungle owlet	*Glaucidium radiatum*	LC	S
38	Indian scops-owl	*Otus bakkamoena*	LC	NK
39	Oriental scops-owl	*Otus sunia*	LC	NK
40	Tawny fish-owl	*Ketupa nipalensis*	VU	NK
41	Brown fish-owl	*Ketupa zeylonensis*	LC	D
42	Brown boobook	*Ninox scutulata*	LC	NK
43	Barn owl	*Tyto javanica*	LC	NK

*Abbreviations: Cr: Critically Endangered, EN: Endangered, NT: Near Threatened, Vu: Vulnerable, LC: Least Concern;
**S: Stable, ID: Insufficient Data, NK: Not Known, I: Increase, RD: Rapid Decline, D: Decline, TI: Trend inconclusive

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